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Triple Air Brake Questions and Answers

BY

E. BURGESS

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QUESTIONS APPLIED TO

NUMBERS.

An air brake..... 1
Air pump.....2 to 41, 62
Air pump, starting.....3 to 6
Air pump, oiling steam end.....7 to 8
Air pump, oiling air end.....10 to 14
Air pump, packing.....15, 16
Air pump, Westinghouse.....17 to 41
Air pump, New York.....42 to 50
Automatic action.....530 to 535
Air pressure.....538 to 540, 543 to 547, ...552, 625, 626, 746
Adjustment 667, 678
Auxiliary reservoir...57, 340, 341, 418, 419, 429
Compensating valve, New York.....559 to 563, ...592 to 597
Conductor's valve.....465 to 469
Cylinders .....327 to 334, 390, 423, 424
Cutting out brakes.....346 to 351, ...397, 398, 454 to 457, 704, 734, 746
Coupling low pressure engine to high pressure train.....739, 740
Care of air cocks and strainers.....900 to 903
Care of triple valves and cylinders..884 to 904
Corrington consolidated valve.....800 to 883
Double heading.....145, 305 to 324
Excess air.....70 to 73
Engineer's valve, Westinghouse.....75 to 197
Engineer's valve, Westinghouse, D-8.182 to 197
Engineer's valve, New York.....198 to 267
Engineer's valve, defects and information, Westinghouse .....129 to 175
Essential parts.....798 to 799
Equalizing reservoir.....56, 99, 161, ...162, 164, 165, 171

181011

Emergency position.....115 to 121,
.....126, 158, 172, 173
Feed valve.....175, 178 to 181, 579, 580
Gauge .....63 to 73, 130, 131, 163, 324
Gauge reading.....625 to 658
Grade braking.....717, 747 to 758
Handling of freight train.....679 to 704
Handling of passenger train.....705 to 746
High pressure (advantage).....60, 536 to 549
High pressure valve, Westinghouse..554 to 558,
.....564 to 571
High pressure brake.....554 to 597
High pressure control.....536 to 539
Kicking off brake.....688, 718 to 721
Leaks 161, 162, 792, 798
Locomotive equipment.....420 to 469
Main reservoir.....52 to 54, 58, 59, 61
Meaning of application..... 652
Name of pipes.....51, 74, 352, 353
Opening of air cocks.....755 to 762
Passenger equipment.....420 to 469
Pressure retaining valve.....444 to 464
Pump governor.....41, 268 to 304, 324, 580
Pipe (broken).....166 to 170, 176, 302 to 304,
.....581, 595, 596, 622, 624, 740 to 743
Release or bleed cock.....342 to 345
Service application, New York.....215 to 257
Supplementary reservoir, New York.....
216, 218, 232, 233, 234, 236, 243, 255 to 257
Straight air brake.....598 to 624
Signal (air).....763 to 791
Triple valve, New York..470 to 496, 510 to 518
Triple valve...335 to 339, 354 to 387, 392 to 417,
.....425, 426. 430 to 442, 453, 497 to 509
Triple blows at exhaust.....519 to 529
Tender brakes.....388 to 419
Train pipe exhaust, Westinghouse...101 to 114
Tests.....659 to 666, 754
Train pipe..... 55
Train left standing on grade..... 753
Train parted.....744, 745
Undesired emergency.....732 to 737

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PREFACE

The contents of this book are founded by years of actual experience and should be thoroughly understood by everyone operating or that is interested therein. It is not the intention of the writer to produce anything that will puzzle the reader, but has shortened the questions and answers in the most simple language, asking and answering questions of three automatic air brake systems. The work is intended principally for those in the operating department or others who may take an interest in the information herein noted.

As the air brake appliance has proven to be one of the most essential features in railway service, it is the duty of every one in that class of service to be thoroughly acquainted with the same.

The duty of an engineer is to become familiar with the appliance in every respect, the manner in which it should be handled to obtain the best possible results with the least possible expense, and the greatest smoothness capable of being developed.

My object is to present the subject as I have found it in actual road service, illustrating the advantage of using air economically. To accomplish these re-

sults will require careful study and thought of every one who has anything to do in connection with the work. My belief however is, those that have anything to do in connection with the air brake will find the contents of this book very useful, as the writer has had years of experience as instructor, Examiner and Supervisor of Air Brakes on one of the leading (eastern) railroads, also has been traveling expert for an air-brake company.

QUESTIONS AND ANSWERS

1. Q. You understand what an air brake is?
A. It is a brake operated by compressed air.

2. Q. How is the air compressed?
A. By an air pump located on the locomotive.

3. Q. How should an air pump be started?
A. Slowly, allowing the pump to warm and condensation to escape.

4. Q. Is there any means applied to the steam end of the pump for the escape of the condensation?
A. Yes, two cocks. One located in lower end of steam cylinder, the other in live steam passage way.

5. Q. When should these cocks be opened?
A. Before starting the pump.

6. Q. How long should the cocks be left open?
A. Until all condensation has escaped. It is not necessary to run with them open.

7. Q. How should the steam end of the pump be oiled?
A. By the lubricator.

8. Q. How many drops of oil per minute does the steam end require?
A. As the class of air pumps vary, also the class of service they are assigned to, judgment should be used as to the quantity of oil used to lubricate the steam end.

9. Q. How fast should an air pump be operated?

A. If possible not to exceed 140 to 150 strokes per minute, and slower if the air pressure can be maintained.

10. Q. How should the air end of a pump be oiled?

A. Through the oil cup or cups, located in the top head for that purpose.

11. Q. What kind of oil should be used?

A. A small quantity of valve oil.

12. Q. Why not oil through the air strainer?

A. If the strainer is used as an oil cup, the oil has a tendency to gum the inlet passages, also the receiving valve.

13. Q. When should the air end of a pump be oiled?

A. When running slow after accumulating a low pressure of air in the main reservoir.

14. Q. How can the air end of the pump be oiled through the oil cup when running?

A. By filling the small cup and opening same at downward stroke, causing the oil to enter cylinder by the vacuum generated by piston movement.

15. Q. When soft packing is used (piston rod) what care should be taken.

A. Great care should be taken in tightening the stuffing box nut, the nut should only be tightened sufficient to prevent leakage, and, as time requires, the nut should be gradually tightened. When tightened too tight at the beginning, the life of the packing is destroyed.

16. Q. Is a swab applied to the piston rod any benefit?

A. A swab taken care of and lubricated with a slight amount of valve oil, has a tendency to lubricate the packing.

9½ OR 11-INCH WESTINGHOUSE PUMP

17. Q. When starting an air pump what is the movement of the main slide valve?

A. It moves to the right.

18. Q. Why does it move to the right?

A. The main valve being controlled by a differential piston, the large piston being attached to that end of the rod, it has the power to move in that direction.

19. Q. What ports are opened?

A. Steam admission port to lower end of cylinder and exhaust port to upper end, also exhaust port to chamber of large differential piston.

20. Q. What would be the action of the main piston?

A. It would move upward.

21. Q. How are the reversing features of the pump obtained?

A. When the main piston has moved to about the end of its upper stroke, the reversing plate attached to piston comes in contact with shoulder on reversing rod, moving same upward, operating reversing valve, closing exhaust port of differential piston chamber and opening admission port to same, causing differential piston to move to the left, operating main slide valve.

22. Q. What ports are opened?

A. Steam admission port to top end of cylinder and exhaust port to lower end.

23. Q. What would be the movement of the main piston?

A. It would move down until the reversing plate attached to piston came in contact with the button on end of reversing valve stem, moving same downward, operating reversing valve, closing steam admission port to differential piston chamber and opening exhaust port of same, causing piston and main slide valve to move to the right.

24. Q. When steam is admitted to right of differential piston why does it have the power to move it to the left?

A. Because the small chamber in which the small piston operates is always open to the atmosphere.

25. Q. How is the air admitted to the air end?

A. By the motion of the piston contained therein, there is a partial vacuum created. The atmospheric pressure lifting receiving valves and entering the empty space.

26. Q. Does both the receiving valves operate at each stroke?

A. No. The lower receiving valve operates at the upward stroke and, upper at downward stroke.

27. Q. How is the air delivered to the main reservoir?

A. When the piston has reached the end of its stroke, the inlet or receiving valve seats, the piston now makes the return stroke compressing the atmospheric pressure confined in the cylinder, when it is compressed sufficiently to lift the discharge valve against the main reservoir air, it does so, entering main reservoir.

28. Q. Does both the discharge valves operate at each stroke.

A. No. The lower discharge valve operates at the downward stroke and, upper at upward stroke.

29. Q. Which side of the air cylinder are the receiving valves located?

A. Those applied to the side of the cylinder the strainer is connected to (left side).

30. Q. Which side, the discharge valves?

A. Those applied to the opposite side (right).

31. Q. What action will the pump have if the lower receiving valve is broken?

A. The downward stroke will be quick.

32. Q. The upper discharge valve broken?

A. The downward stroke will be quick.

33. Q. How would you know the difference between a broken receiving or discharging valve?

A. The upper discharge valve broken, the main reservoir air would follow the air piston, destroying the partial vacuum, preventing atmospheric pressure from entering upper receiving valve, the lower receiving valve broken, the atmospheric pressure could not be retained in cylinder and would discharge or blow back. As the inlet (where the strainer is connected) leads to both the upper and lower receiving valves, a broken receiving valve will not cause a blow to the atmosphere as it would if each valve had a separate inlet port. With careful attention it can be noted by the blow back at the air inlet.

34. Q. How about upper receiving and lower discharge valves broken?

A. The action of the pump will be vica vica.

35. Q. What causes an air pump to heat (run hot)?

A. Excessive labor. Piston rod packing burnt or blown out. Defective air valves. Worn out or gummed rings in the air piston. Air passages partly plugged.

36. Q. What is a standard lift of air valves for nine and one-half inch air pump?

A. Three thirty-seconds of an inch.

37. Q. What causes an air pump to groan?

A. Short of lubrication, sometimes in the steam end, other times in the air end, also dry piston rod packing, worn rings in the air end will also cause it.

38. Q. If the pump stops from an unknown cause, can you tell if the trouble is in the pump or the governor?

A. Yes.

39. Q. How can you tell?

A. By opening the exhaust cock, located in the steam line.

40. Q. If the steam discharge is strong from the cock, what would that indicate?

A. It would indicate that the trouble was in the pump.

41. Q. If the trouble was in the governor, steam would not discharge from the cock referred to, would it?

A. No. The steam valve in the governor would be seated, closing the port, the discharge of steam through the cock would be slight.

NEW YORK DUPLEX PUMP

42. Q. Why is it called duplex?

A. Because the pump compresses two unequal pressures.

43. Q. Which are the air ends?

A. The upper.

44. Q. Which is the high and low pressure end?

A. Right is low; left, high pressure.

45. Q. When starting the pump, what is the first movement?

A. The piston in the low pressure end will move upward.

46. Q. Does the main valve that is operated by the low pressure end control steam admission and exhaust ports for the low or high pressure cylinder?

A. It is a cross port device, the reversing valve that is operated by the low pressure side, operates the admission and exhaust ports to the high pressure end, likewise with the high pressure side, vica vica.

47. Q. How is the reversing feature operated?

A. By its rod, a plate being applied to the main steam piston, same as other brake companies.

48. Q. How is the air admitted to the air end?

A. At the movement of the low pressure piston it creates a partial vacuum, atmospheric pressure lifting the receiving valve and enters the empty space; the piston in high pressure end now operates creates a partial vacuum. The atmospheric pressure which is in the low pressure cylinder (which has just been admitted by the movement of the piston) lifts the discharge valve and enters the empty space. The atmospheric pressure now lifts both the receiving and discharge valves of the low pressure cylinder and enters both low and high pressure cylinders. The low pressure piston now operates, discharging the atmospheric pressure (contained therein) to the high pressure cylinder, the high pressure piston now operating compressing the air contained in its cylin-

der sufficiently to lift the discharge valves against the main reservoir air, it does so entering the main reservoir.

49. Q. How many air valves are applied to a pump?

A. Six, two receiving and four discharge.

50. Q. When do the six valves operate?

A. The receiving and discharge valves (located central of the two air cylinders) operate at the operation of the low pressure piston, the same discharge valves operate as receiving valves for the high pressure cylinder, at the operation of its piston. The high pressure discharge valves are located at left of cylinder and operate at the operation of the high pressure piston.

51. Q. Name the pipe forming connection between air pump and main reservoir?

A. Discharge pipe.

52. Q. Where is the air stored which is used to operate the system?

A. Main reservoir (train pipe), equalizing and auxiliary reservoir.

53. Q. What is the main reservoir used for.

A. For storing a volumn of air and acts as a drain for the system.

54. Q. What is the main reservoir air used for?

A. For the charging of the equipment, releasing of the brakes and recharging.

55. Q. What is the train pipe used for?

A. To convey the air back, distributing it to each car.

56. Q. What is the equalizing reservoir used for?

A. It stores a volumn of air that is used to operate the equalizing piston.

57. Q. What is the auxiliary reservoir used for?

A. It stores a volumn of air that is used for the breaking power of that car, tender or driving brake, as the case may be.

58. Q. What is the cubical contents of the main reservoir?

A. They vary in size, ranging from twenty thousand to sixty thousand cubic inches. The larger ones being used in freight service.

59. Q. Is there any advantage by using large main reservoirs?

A. Yes. There is a larger volumn stored ready for use.

60. Q. Is there any advantage in carrying a high main reservoir pressure?

A. Yes. High pressure of air in the main reservoir has more energy, produces a greater velocity in train pipe and releases the brakes much quicker.

61. Q. How often should the main reservoir be drained?

A. At the end of every trip, when convenient, at times along the road.

62. Q. Can some of the condensation or water which is found in the main reservoir be avoided?

A. Yes. By running the pump as slow as possible (yet maintaining a standard pressure), avoid heating the air when being compressed any more than necessary.

AIR GAUGE

63. Q. Where should the air gauge be located.
A. In direct sight of the engineer.

64. Q. What class of an air gauge is used?
A. Duplex.

65. Q. Why are they called duplex?
A. Because there are unequal pressures recorded on the same dial.

66. Q. What is the color of the dial?
A. Usually white, there are a few black.

67. Q. What air does the red hand record?
A. Main reservoir air.

68. Q. What air does the black "or white" hand record?
A. Train pipe.

69. Q. Any other storage of air you know of it records?
A. Yes. Equalizing and auxiliary reservoirs.

70. Q. What does the difference between the two hands represent?
A. The excess air.

71. Q. Where is the excess air stored?
A. In the main reservoir.

72. Q. What is the excess air used for?
A. For releasing the brakes and recharging the auxiliary reservoirs.

73. Q. Do you understand the excess air is essential?
A. Yes. It requires excess air to obtain a prompt and quick release of the brakes.

74. Q. Name the pipe forming the connection between main reservoir and engineer's brake valve.

A. Main reservoir delivery pipe.

WESTINGHOUSE

Engineer's brake and equalizing discharge valve. (Formerly D-5, E-6, F-6 and at present G-6.)

75. Q. What is an engineer's valve used for?

A. For operating the air between main reservoir and train pipe, between train pipe and atmosphere when applying the brakes.

76. Q. How many positions are there to the Westinghouse valve?

A. Five.

77. Q. Name the five?

A. No. 1, release; No. 2, running; No. 3, lap; No. 4, service application; No. 5, quick action, "emergency."

78. Q. What communication is there when handle is in (No. 1) release position?

A. There is a direct communication between main reservoir and train pipe, including equalizing reservoir, also the warning port is open.

79. Q. Name the air the warning port discharges.

A. Main reservoir air.

80. Q. Why is it called warning or alarm port?

A. The discharge of air exhausting warns the operator not to run the handle in that position.

81. Q. Why should the handle not be run in that position?

A. The equipment would be overcharged.

82. Q. Would that be damaging in any way?

A. With the equipment charged to main reservoir air, an application made, setting the brakes in full, the wheels would slide.

83. Q. What is the proper position to carry the handle while running?

A. Running position No. 2.

84. Q. Why is it the proper position?

A. The communication in that position between main reservoir and train pipe is automatically controlled by the feed valve.

85. Q. What communication is there in running position No. 2?

A. There is a communication between main reservoir and train pipe of five-sixteenth port.

86. Q. How long does this communication remain?

A. Until the train pipe and auxiliary reservoirs are charged to the pressure which the feed valve is set for.

87. Q. Is there any communication to the equalizing reservoir?

A. Yes, whenever there is communication between main reservoir and train pipe there is always communication between train pipe and equalizing reservoir.

88. Q. Does the operation of the feed valve close the communication between train pipe and equalizing reservoir?

A. No, this communication remains open until valve is lapped.

89. Q. Name the train-pipe governor.

A. Feed valve.

90. Q. What ports are open when handle is in position No. 3?

A. Not any, that is lap position.

91. Q. What is the meaning of lap?

A. That is a position whereby the metal of the rotary valve covers all ports in the seat.

92. Q. Where is the beginning and ending of main reservoir air?

A. Main reservoir air begins at the top of the discharge valves of the pump and ends at the seat of the rotary valve.

93. Q. What air is on top of the rotary valve, extending through its ports?

A. Main reservoir air.

94. Q. What air is under rotary valve?

A. Train pipe and equalizing reservoir air.

95. Q. The rotary valve becomes a divider between what airs?

A. Between main reservoir and train pipe, also main reservoir and equalizing reservoir.

96. Q. What is the divider between equaling reservoir and train pipe air?

A. The equalizing piston.

97. Q. What air is on top of the equalizing piston?

A. Equalizing reservoir air.

98. Q. What air is under the piston?

A. Train-pipe air.

99. Q. Do you understand the equalizing reservoir air now becomes an individual pressure?

A. Yes, the equalizing reservoir air is an individual. When the handle is in No. 1 or No. 2 position it is not.

100. Q. What prevents the train-pipe air from discharging to the atmosphere, through ports in the valve, when the handle is on lap No. 3?

A. Air in main and equalizing reservoirs, rotary valve and equalizing piston.

101. Q. Handle of valve in service position No. 4. Does the air, discharging through the preliminary exhaust port, come from the train pipe or where?

A. It comes from the equalizing reservoir, off of the piston (reducing the pressure on top).

102. Q. What is the action of the piston?

A. It raises (moves up).

103. Q. What air moves it up?

A. Train-pipe air.

104. Q. Why does train-pipe air cause the piston to raise?

A. Because the pressure has been reduced on the top of it; the train-pipe air being the highest pressure, naturally the piston will move against the weaker or lesser pressure.

105. Q. What air discharges?

A. Train-pipe air.

106. Q. How long does the train-pipe air discharge.

A. Until reduced a trifle below the air in equalizing reservoir. (Just enough to overcome the friction of the packing ring in the piston.)

107. Q. What will be the action of the piston?

A. It will move downward, closing the exhaust port.

108. Q. When does the longest discharge occur from the exhaust port, long or short train?

A. Long train.

109. Q. Then with practice can you say about how many cars equipped with the air brake you are operating?

A. Yes, by paying strict attention to the discharge from the train-pipe exhaust, when a service application is being made.

110. Q. Where is the air stored the engineer operates when making a service application?

A. In the equalizing reservoir (little drum).

111. Q. How is the train-pipe air operated?

A. By the equalizing piston.

112. Q. On making a five-pound reduction, when would the engineer operate the most air long or short train?

A. There would be no difference, as the air the engineer operates is stored in the equalizing reservoir.

113. Q. When would the equalizing piston operate the most air?

A. In a long train.

114. Q. In a service application, the engineer does not operate the train-pipe air, does he?

A. No, the equalizing piston operates the train-pipe air.

115. Q. Is there any time you know of when the engineer operates train-pipe air?

A. Yes, on an emergency application.

116. Q. In what position would he place the handle?

A. No. 5 position.

117. Q. Handle of valve in No. 5 position. What communication is opened in the valve?

A. Large communication between train pipe and atmosphere, causing a sudden reduction of train-pipe air.

118. Q. Does the equalizing piston raise and discharge train-pipe air also?

A. No, it remains seated.

119. Q. Is the preliminary exhaust port open?

A. Yes, it has no action on the piston.

120. Q. Does the black or white hand of the gauge fall more rapidly on an emergency application than it does in service?

A. No, the black or white hand is connected to the equalizing reservoir, the same preliminary port being open in either application.

121. Q. Do you understand that the engineer operates the train-pipe air on an emergency application?

A. Yes.

122. Q. How many exhaust ports has the Westinghouse engineer's valve?

A. Three.

123. Q. Name them.

A. Two train-pipe exhaust ports and one preliminary.

124. Q. Why has the valve two train-pipe exhaust ports?

A. As the brakes can be operated by either application, emergency or service, to enable the engineer to operate successfully, each application must have its exhaust port controlled by its own feature.

125. Q. How is the train-pipe exhaust port operated for an emergency application?

A. By the movement of the rotary valve.

126. Q. How is the train-pipe exhaust port operated for a service application?

A. By the movement of the equalizing piston.

127. Q. How is the preliminary exhaust port operated?

A. By the movement of the rotary valve.

128. Q. When is the longest discharge obtained from the preliminary exhaust port?

A. The discharge is the same regardless length of train, it is the train-pipe exhaust that varies in discharge.

129. Q. When releasing the brakes on a light engine, why does the train-pipe exhaust blow at different times?

A. That is owing to the large volume of main reservoir air, feeding the train pipe (under the piston) more rapidly than it does equalizing reservoir (top of piston).

130. Q. Handle of valve in release position No. 1, the hands on the gauge do not record the same pressure, where is the trouble?

A. The trouble is in the gauge.

131. Q. What would you do?

A. Report the gauge on arrival at engine house.

132. Q. Handle of valve in running position No. 2, the train-pipe hand raises and indicates the main reservoir air, what would you do?

A. The trouble might be in the feed valve, I would try and regulate same; if it could not be regulated, I would report the trouble on arrival at engine house.

133. Q. How would you proceed to regulate the feed valve?

A. By removing the cap nut and backing out the adjusting plug, then making an application, release the brakes, placing the handle in running position and noting the train-pipe hand, by so doing I would ascertain if the trouble was in the feed valve.

134. Q. Is there anything else you know of that would cause both hands to record the same pressure or cause black hand to climb slowly (overcharging)?

A. Yes, three other defects.

135. Q. What are they?

A. Broken body gasket, (left side) broken case gasket, (between feed valve and brake valve) rotary valve leaking.

136. Q. How would you know if the defect was in the body gasket, rotary valve, or feed valve, or case gasket?

A. Lap the valve, if the black hand remains stationery, the defect would be in the feed valve or case gasket, if it still continues to raise, the defect would be in the rotary valve or body gasket.

137. Q. How would you know if the defect was in the rotary valve or body gasket?

A. Lap the valve, if the black hand climbed more rapidly, then, when in running position, the trouble would be in the body gasket.

138. Q. Why would the black hand climb more rapidly when the valve is lapped, than it does when in running position, if the body gasket is defective?

A. On lapping the valve the equalizing reservoir is made an individual, with the body gasket broken on the (left side) the air from the main reservoir is feeding direct into it, causing the hand to raise.

139. Q. How would you test for a leaky rotary valve?

A. When the engine is alone, examine the train-pipe exhaust, ascertaining if there is any air escaping, apply the brakes by making a reduction of about ten pounds, close the double-heading cock, examine the train-pipe exhaust again, if the air is escaping more than it did on the first examination, the rotary valve is leaking. The rotary valve may leak and not have any action on the piston, black hand will raise.

140. Q. Do you understand a leaky rotary valve is one of the most dangerous defects there are?

A. Yes, more so on a short than a long train.

141. Q. Explain why?

A. On making an application and lapping the valve, if the rotary valve leaks it will allow air from the main reservoir to leak into the train pipe, increasing it, releasing some or all of the brakes, causing another application to be made, finally the air in the auxiliary reservoir will be exhausted.

142. Q. Why will a leaky rotary valve show its defect quicker on a short train than it does on a long one?

A. Where the brakes are in same condition, there is less leakage and volume to supply in a short train, therefore any leakage from main reservoir in the train pipe would increase the pressure more rapidly.

143. Q. When a leaky rotary valve occurs, and you are compelled to take the engine, what can be done to take the train with safety?

A. Create a leakage of train-pipe air equivalent to leak in rotary valve.

144. Q. What would you do on arrival at a terminal?

A. Report the valve.

145. Q. Whenever the double-heading cock has been closed, what would you do?

A. Make an application and examine the brakes on the engine to see if they apply and release, for with this cock closed I cannot operate the brakes.

146. Q. Handle of valve in lap position No. 3, black hand is falling (dropping back). The equalizing piston is raising discharging train-pipe air, what is the trouble?

A. Leakage of air in equalizing reservoir or pipe leading to black hand.

147. Q. Handle of valve in lap position No. 3, black hand is falling (dropping back), equalizing piston remains seated, what does that indicate?

A. Leakage of train-pipe air.

148. Q. The black hand is connected to the train pipe, is it not?

A. No, it is connected to the equalizing reservoir.

149. Q. Why should leakage of train-pipe air cause the hand to fall?

A. It falls back, as air in the equalizing reservoir is leaking by the joint in the packing ring of the equalizing piston.

150. Q. Air gauge registering standard pressure. On making an application handle in service position No. 4, air discharging freely through the preliminary exhaust, black hand on gauge remains stationery, equalizing piston fails to raise, what is the trouble?

A. The body gasket is broken on the right side or the packing ring of equalizing piston is loose or broken.

151. Q. Would the action of the valve be the same if the body gasket was broken on the left side?

A. The action of the valve would be the same, hand on the gauge would act different.

152. Q. How would the hand on the gauge act?

A. If the body gasket was broken on the left side there would be communication between the main reservoir and top of equalizing piston having a tendency to overcharge when in running position. On lapping the valve, the hand on the gauge would raise.

153. Q. Explain why a broken gasket or defective packing ring interferes with action of the equalizing piston?

A. It partly or wholly destroys the individual feature of the valve, annulling or retarding the action of the equalizing piston.

154. Q. Handle of valve in service position No. 4, hand on gauge recording reduction made, equalizing piston fails to operate, what is the trouble?

A. Equalizing piston struck.

155. Q. How would you apply the brakes?

A. Place the handle on position No. 5 (about the width of handle spring), allowing it to remain there until I would feel the brakes apply, the application being sufficient I would lap the valve very slowly.

156. Q. Why should the valve be lapped very slowly?

A. If the valve was lapped quickly, train-pipe air would surge, releasing some of the brakes on the head end (if the train was long), causing the train to part.

157. Q. Would the valve have to be operated more carefully in a long train?

A. Yes, the surging of train-pipe air would be greater.

158. Q. Why can the brakes be applied by moving the handle on No. 5 position when they cannot be set in service No. 4?

A. The operator then operates the train-pipe air, in service he only operates the equalizing reservoir air and the piston operates the train-pipe air for him.

159. Q. On making an application, handle of valve on lap, should the equalizing piston fail to seat, what would be the defect?

A. There might be a piece of scale on the valve seat or piston dirty, or leak in equalizing reservoir or gauge pipe.

160. Q. What would you do?

A. Make another slight reduction, causing the piston to lift again, allowing the scale to be blown off if possible, at times, tapping the valve will cause the piston to seat, when there is a leak in the equalizing reservoir, tapping or reductions will not cause the piston to seat, the leak must be found and repaired.

161. Q. When does a slight leak in the equalizing reservoir or gauge pipe show the defect quickest, engine light or coupled to a train?

A. Coupled to a train.

162. Q. Is it possible to have a slight leak in the equalizing reservoir or gauge pipe with a light engine, and not be noticeable and, when engine is coupled to the train the defect shows.

A. Yes, that is due to train-pipe volume.

163. Q. On making a service application, the black hand does not record the reduction, what is the trouble?

A. Friction in gauge, plugged pipe or hand loose.

164. Q. What is the time required to discharge twenty pounds from the equalizing reservoir?

A. Equalizing reservoir, 10x12 inches, air seventy pounds, time will be about five seconds. Equalizing reservoir, 10x14½ inches, air seventy pounds, time will be about six and two-fifth seconds.

165. Q. At one hundred and ten pounds pressure what is the time?

A. Equalizing reservoir, 10x14½ inches, time to discharge 20 pounds, will be about four and one-fifth seconds.

166. Q. How would you proceed if both gauge pipes were broken?

A. Blind them, run without a gauge.

167. Q. If the low duplex governor pipe was broken?

A. Blind it.

168. Q. If the high duplex governor was broken?

A. Blind it and govern the pump by the throttle valve, when valve is left on lap any length of time.

169. Q. If both the duplex governor pipes were broken?

A. Blind them and govern the pump by the throttle valve.

170. Q. How would you proceed if the pipe leading to the equalizing reservoir was broken?

A. Blind its connection at the engineer's valve, also blind train-pipe exhaust (elbow).

171. Q. Why do you blind train-pipe exhaust?

A. Because the equalizing reservoir stores the volume of air to operate the piston and with it blinded the volume would be to small to operate it, as soon as valve was placed in No. 4 position, the small volume would discharge, piston raising, discharging too great a volume from train pipe, causing the application to be too great.

172. Q. How do you do the braking with the exhaust you speak of closed?

A. Same as I would if the equalizing piston was stuck.

173. Q. Where is the emergency position; extreme right?

A. No. 5 emergency position commences when handle spring climbs the shoulder, leaving service No. 4.

174. Q. What causes a valve to handle hard soon after it has been lubricated?

A. Usually the seat of the rotary valve is a trifle high at the edge.

175. Q. How would you proceed if the feed valve was broken?

A. Use a blind between feed valve and body of engineer's valve, run the handle in release position No. 1, throttle the pump, so as not to overcharge train pipe. When making an application run the pump faster to accumulate the excess air, that I would be in condition to release the brakes when required.

176. Q. How would you proceed if both gauge and governor pipes were broken?

A. Blind them.

177. Q. Would you not be afraid of overcharging the train pipe?

A. No, the feed valve has not been disturbed.

178. Q. What is the advantage of a slide valve feed valve over the old-style feed valve?

A. First, the port is operated by a slide valve instead of a pocket valve, which is not so apt to leak; second, the diaphragm is metal instead of rubber, which makes it more durable; third, there being a more rapid feed until it has supplied the number of pounds it is set for, while with the old style valve the feed was rapid until the pressure reached about fifty-five pounds; piston then commenced to move, supply valve following, reducing the feed.

179. Q. Do you understand the operation of the slide valve feed valve?

A. Yes.

180. Q. Explain.

A. When the handle is in running position No. 2, the main reservoir air has direct communication to the chamber of the small slide valve and inner side of piston (when main reservoir air has been accumulated to about five pounds), moving it outward, compressing the spring, moving slide valve, opening port between main reservoir and train pipe, the train-pipe air being in constant communication with inner side of diaphragm, the diaphragm touching the stem of regulating valve (this valve is off its seat), allowing a small communication to be opened between outer side of (slide valve) piston and the train pipe (top of diaphragm). When the train-pipe air has reached the pressure, which the valve is set for, it moves the diaphragm (against the power of the spring), causing regulating valve to seat, the air in chamber (outer side of piston) can no longer escape to the train pipe, it equalizes with main reservoir air,

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spring reacting moving piston and valve inward, closing port between main reservoir and train pipe.

181. Q. Explain the operation of the old-style feed valve?

A. When the handle is in running position No. 2, main reservoir air has direct communication to chamber of supply valve, the supply valve being off its seat, air feeds direct to the diaphragm, then to the train pipe. When the train-pipe air reaches the pressure which the valve is set for, it moves the diaphragm against the power of the regulating spring, the supply valve follows, closing the port between main reservoir and train pipe.

182. Q. What is the difference between the operating parts of the D-8 valve and the present G-6?

A. The D-8 valve has no warning port. In running position the communication is indirect, excess air must be obtained before port is opened between main reservoir and train pipe, the port being one-fourth inch instead of five-sixteenth, while in the G-6 this communication is about direct. The operation is the same in 3, 4 and 5 positions, except preliminary exhaust port is closed in No. 5 position.

183. Q. How is the excess pressure regulated in the D-8 valve?

A. By the excess pressure valve spring.

184. Q. If there is more excess required, would the spring be strengthened or weakened?

A. Strengthened.

185. Q. Can the excess pressure valve be taken out?

A. Yes. Place the handle in No. 4 position, exhausting the air; remove the valve, clean or repair as is necessary.

186. Q. How is the train-pipe air regulated?
A. By the pump governor.

187. Q. Handle in what position?
A. Release No. 1 and running No. 2.

188. Q. How about lap No. 3?
A. The pump governor is cut out on lap.

189. Q. In what position is the handle usually carried when running?
A. Release position.

190. Q. Why do you carry it there?
A. Because when the handle is in running position at different times the brakes apply.

191. Q. What causes the brakes to apply at different times?
A. Leakage of train-pipe air.

192. Q. Why don't the leakage of train-pipe air cause the brakes to apply in release position?
A. In release position there is direct communication between main reservoir and train pipe. In running position there is not any until the excess pressure has been obtained in main reservoir.

193. Q. Then the handle cannot be carried in running position, when there are leaks in train pipe, can it?
A. Yes.

194. Q. How can it be carried there?
A. By moving the handle from running position to release back and forth until the excess pressure has been accumulated in main reservoir, it then will force the excess pressure valve from its seat, opening communication between main reservoir and train pipe.

195. Q. What is the defect when the excess pressure cannot be maintained in running position?

A. Excess pressure or rotary valve leaking.

196. Q. How can you tell a leaky rotary valve from a leaky excess pressure valve?

A. By lapping the valve, if the black hand does not rise the trouble is in the excess pressure valve (if it rises it is in the rotary valve).

197. Q. Is it possible for the rotary and excess pressure valve to be tight and yet not maintain the excess pressure in running position?

A. Yes, there may be slack motion in the valve handle, spring or positions defective.

NEW YORK

POSITIVE DISCHARGE. ENGINEER'S BRAKE VALVE.

198. Q. What is it used for?

A. For the same purpose as other brake company's.

199. Q. Is it a rotary or pull movement?

A. It is a pull movement, operating a slide valve.

200. Q. How many positions has the valve?

A. There are nine positions on the rack (quadrant), which the handle can be placed in.

201. Q. Name the positions?

A. Release No. 1, running No. 2, lap No. 3; service positions are 4, 5, 6, 7 and 8; No. 9 is quick action, used for an emergency.

202. Q. What communication is there in release position No. 1?

A. Direct between main reservoir and train pipe, and between valve head cap and atmosphere.

203. Q. Is there a supplementary reservoir connected with the valve?

A. Yes.

204. Q. What is its duty?

A. To store the volume of air which is used to operate the piston.

205. Q. How is the supplementary reservoir charged in the latest valve, 1902 model?

A. From the train-pipe air, by means of a port through the piston.

206. Q. If the handle is left in release position until the system is charged, what pressure will the gauge register?

A. Train-pipe air.

207. Q. Why so?

A. Because the governors connection is made to the train pipe.

208. Q. What is the proper position to carry the handle in while running?

A. Running position No. 2.

209. Q. What communication is there in running position?

A. Not any, until the excess air has been obtained in the main reservoir.

210. Q. How does the excess air form communication between the main reservoir and train pipe?

A. When the excess air has been obtained, it forces the excess valve from its seat against the power of the spring, opening the port between main reservoir and train pipe.

211. Q. Does the same communication remain between train pipe and supplementary reservoir?

A. Yes, if it is necessary to charge supplementary reservoir.

212. Q. With the handle on lap position No. 3, what communication is there?

A. Not any, all ports are closed, except exhaust port from valve head (or cap).

213. Q. What closes the ports?

A. Slide valve.

214. Q. What is the divider between main reservoir and train pipe?

A. Slide valve.

215. Q. The handle is moved to the next position, which is classed as one of the service positions (No. 1 service or) fourth position of the valve, what communication is there?

A. The train pipe is opened direct to the atmosphere through a graduated port.

216. Q. How long does this port remain open?

A. It will remain open until piston has moved inward and the air in supplementary reservoir has been reduced (by expansion) equivalent to reduction made in train pipe.

217. Q. What reduction has been made of train-pipe air?

A. About five pounds.

218. Q. What is the divider between supplementary reservoir and train-pipe air?

A. Piston.

219. Q. Handle moved to next position (No. 2 service or), fifth position, what is the action?

A. Same as occurred in previous service position, all the difference, piston has moved a trifle more inward.

220. Q. What reduction has been made of the train-pipe air?

A. About four pounds more (total about nine pounds).

221. Q. Handle moved to next position (No. 3 service or), sixth position, what is the action?

A. Same as occurred in previous position, all the difference, piston has moved a trifle more inward.

222. Q. What reduction has been made of train-pipe air?

A. About four pounds more (total about thirteen pounds).

223. Q. Handle moved to next position (No. 4 service or), seventh position, what is the action?

A. Same as occurred in previous service position, all the difference, piston has moved a trifle more inward.

224. Q. What reduction has been made of the train-pipe air?

A. About five pounds more (total about eighteen pounds).

225. Q. Handle moved to next position (No. 5 service or), eighth position of the valve, what is the action?

A. Same as occurred in previous positions, all the difference, piston has moved a trifle more inward.

226. Q. What reduction has been made?

A. About five pounds more (total twenty-three pounds).

227. Q. On moving the handle by the eighth position, would air still discharge through same service port?

A. No, the large train pipe-exhaust would be opened, which is used when operating for an emergency.

228. Q. The handle would be in what position?
A. No. 9 emergency.

229. Q. Where is the emergency position?
A. The emergency position commences when handle is moved beyond eight, but is not open in full until it reaches No. 9 extreme end.

230. Q. Has the piston moved the extreme travel when handle is in No. 8 position?
A. Yes.

213. Q. Explain why?
A. The piston does not make two moves to each reduction, it simply makes one, that being an inward move and so on until it has traveled the extreme length.

232. Q. How much air is in the supplementary reservoir?
A. Same as in the train pipe.

233. Q. Was any of the air in the supplementary reservoir discharged?
A. No.

234. Q. What caused the reduction?
A. The reduction was caused by expansion, piston moving inward, increasing size of space.

235. Q. Which side of the piston is train-pipe air?
A. Inner side.

236. Q. Which side is supplementary reservoir air?
A. Outer side.

237. Q. When applying the brakes, the piston becomes the divider between what pressures?
A. Supplementary reservoir and train-pipe airs.

238. Q. How is the train-pipe air operated (service application)?

A. By the engineer.

239. Q. How is the train-pipe exhaust port opened (service application)?

A. By the engineer.

240. Q. How is the train-pipe exhaust port closed (service application)?

A. It is closed automatically by the movement of the piston, which acts on a lever, the lever operating a small graduating slide valve, closing the exhaust port in main slide valve.

241. Q. When will the piston move back to normal position?

A. Whenever the handle of valve is placed in lap, running or release position.

242. Q. Why so?

A. As in anyone of the three positions mentioned, the exhaust port is opened from outer side of piston (supplementary reservoir air) to the atmosphere, reducing the pressure, train-pipe air now being greater, moves the piston back to normal position.

243. Q. Does all the air of supplementary reservoir exhaust?

A. No. At the outward movement of piston its valve seats on the head (or cap) closing the port between it (piston) and the atmosphere.

244. Q. In operating, making an application, the handle is not moved back to lap, same as in Westinghouse valve, is it?

A. No.

245. Q. Why not?

A. If the handle is moved back to lap it will close the exhaust port and brakes will not apply.

246. Q. How should the valve be operated to make a reduction (service application)?

A. Whenever a service application is required, the handle should be moved to any one of the service positions (if nine pounds was required, second notch), allowing it to remain in that position, the piston will move and automatically close the exhaust port from the train pipe.

247. Q. In what position would the handle be placed to make a continuous reduction of about twenty-three pounds?

A. In (No. 5 service or) eighth position of the valve.

248. Q. On making a five-pound reduction, handle in (first service or) fourth position of the valve, the exhaust from train line has ceased (indicating the piston has moved inward, closing the exhaust port), can the handle be moved back to lap?

A. Yes.

249. Q. What is the action of the piston?

A. The exhaust port is opened from the outer side of piston to the atmosphere, the train-pipe air on the opposite side, moves piston back to normal position, ready for another reduction in the same position.

250. Q. After making a five-pound reduction, the handle is moved to the next position and, there is not any discharge of train-pipe air, what does that indicate?

A. Leakage of train-pipe air.

251. Q. Then it can be ascertained by the valve if there is a leakage of train-pipe air, without looking at the gauge, can it not?

A. Yes.

252. Q. What would you do if the gauge pipes were broken?

A. Blind them and go on.

253. Q. Would you know, when operating, how to make five, nine or thirteen-pound reduction?

A. Yes. That is known by the positions of the valve.

254. Q. What would you do if the pipe was broken leading to the supplementary reservoir?

A. Blind it.

255. Q. How would you operate the valve?

A. In the same position as when supplementary reservoir was connected, the only difference it would make, I would have to move handle to lap slowly closing the exhaust port, the piston being inoperative (cut out).

256. Q. What effect will a leak in the air of the supplementary reservoir have?

A. It will annul the action of the piston, cutting out the automatic, closing of the train-pipe exhaust port (service), the handle of valve would have to be lapped slowly to close the port.

257. Q. What effect would a leak by the piston (air of supplementary reservoir leaking to train pipe) have?

A. It annuls the action of the piston same as a leak in supplementary reservoir.

258. Q. What effect would a leaky slide valve have on the system?

A. Same effect as the rotary in Westinghouse valve.

259. Q. How would you test for a leaky slide valve?

A. When there is not any air in the equipment, lap the valve, start the pump, open the angle cock at rear of tender and hold hand over hose coupling, or place coupling in pail of water, if the water bubbles, the slide valve is leaking.

260. Q. What effect would a leaky graduating or cut-off valve have?

A. It would cause a slight blow at exhaust port (of valve body), when application is on. The same as a slight leak by the piston would. There are times when a main slide valve leaking will cause the same blow.

261. Q. How can you say if it is the main-slide valve, graduating cut-off valve or piston leaking?

A. When the engine is alone, place handle of valve in emergency position, when all air has been exhausted from train pipe, place handle back to lap, if the valve still blows at the train-line exhaust, it is the main-slide valve leaking.

262. Q. How many exhaust ports has the valve?

A. Three.

263. Q. Name them?

A. One supplementary and two train-pipe exhausts.

264. Q. Why has the valves two train-pipe exhausts?

A. As the brakes can be operated either by an emergency or service application, to enable the engineer to operate successfully each application, each

application must have its exhaust controlled by its own feature.

265. Q. What feature does the excess pressure valve and spring control?

A. Same as in Westinghouse D-8 valve.

266. Q. What causes the valve to work hard?

A. Lack of lubrication, either of slide valve or handle shaft.

267. Q. Can you lubricate the slide-valve seat without taking valve apart?

A. Yes. When there is no pressure accumulated on engine, the two oil plugs (in slide-valve cap) can be removed and a few drops of valve oil dropped in on the seat. Replacing the plugs. Then work the handle back and forth before the pump is started.

PUMP GOVERNOR

268. Q. Where is it located?

A. In the steam line near the pump.

269. Q. What is its duty?

A. To govern the pump.

270. Q. Does it govern the volume of steam required to run the pump?

A. No. It simply opens and closes the steam passage way.

271. Q. How is the volume of steam regulated?

A. By the throttle valve (globe valve).

272. Q. To what air is the single governor top connected in the G-6 valve?

A. Main reservoir air.

273. Q. To what air is the duplex high-speed governor tops connected in the G-6 valve?

A. Main reservoir air.

274. Q. To what air is the duplex governor tops connected?

A. Both to the main reservoir air.

275. Q. How can this governor be duplexed by the operation of the engineer's valve?

A. The high pressure governor top is connected direct to the main reservoir air and cannot be cut out by the operation of the valve, the other is connected indirect by drilling and tapping into the air passage, between the rotary valve seat and joint of feed valve, when handle is in running position there is main reservoir air in this passage, handle being lapped, communication between main reservoir and this passage is cut off, which cuts out the operation of the low pressure, cutting in the high pressure governor top.

276. Q. How is the high-speed governor duplexed.

A. By operating the cock located in the small-branch pipe, leading to the low pressure governor top.

277. Q. What is the normal position of steam and diaphragm valve?

A. The steam valve is unseated, steam port open, diaphragm valve seated, air port closed.

278. Q. How is the steam valve opened?

A. By the coil spring located under its piston.

279. Q. How is the diaphragm valve seated?

A. By the tension of (regulating) spring.

280. Q. Explain the operation of the governor?

A. Steam valve being opened on starting the pump, steam passes direct into the pump, when the pump has accumulated the pressure of air which the governor is set for (the air being under diaphragm) it raises the diaphragm unseating its valve, feeding

to the top of steam piston, moving same down, seating steam valve, shutting off pump.

281. Q. Does the pump shut off entirely?

A. No, it is reduced to a very slow motion.

282. Q. Where is the port located that causes the slow motion?

A. It is a small port drilled through the steam valve, for the purpose of admitting steam to the pump to keep it in motion when the maximum pressure has been obtained.

283. Q. How is the pump started to normal speed again?

A. Whenever the pressure is reduced (which the governor is connected to), the air pressure being under diaphragm is reduced, the regulating spring re-acts, moving diaphragm down, seating its valve, closing the port to the steam piston, air that is on top of steam piston escaping to the atmosphere through small relief port. The piston moves upward, unseating steam valve.

284. Q. What moves the piston upward?

A. Its coil spring, assisted by steam pressure under its valve.

285. Q. Can you say if the diaphragm valve is leaking?

A. Yes, air will be continually escaping at the relief port.

286. Q. Where is the small relief port located?

A. Just above the nipple thread in the governor top.

287. Q. What advantage is obtained by the relief port?

A. It assures a prompt (starting) action of the governor.

288. Q. The relief port should always be open, should it not?

A. Yes.

289. Q. What would be the action if the port was plugged?

A. At the seating of the diaphragm, the air in the cylinder would have to escape by the packing in the piston, if the packing ring be of good fit, the pump would be quite tardy in starting.

290. Q. Is there a vent port in the governor?

A. Yes, that is located in the body and usually has a pipe attached to it.

291. Q. At times the pipe gets plugged (filled with gum, dirt or ice), how will the governor then act?

A. The governor will not shut off the pump.

292. Q. Why not?

A. Steam will accumulate under the piston and prevent air pressure from moving same down.

293. Q. What should be done?

A. Clean out the pipe or disconnect same at its union, if the pipe is long, report it and have same shortened.

294. Q. How is the governor regulated?

A. By removing the cap nut and operating the adjusting plug.

295. Q. Which way would it have to be turned to increase the pressure?

A. It has a right thread, turn it to the right to increase, vice versa to decrease.

296. Q. Has the New York pump governor a diaphragm valve?

A. No. The diaphragm forms the features or functions of a valve.

297. Q. What are the features of a New York governor in duplexing air pressure?

A. Same as other company's.

298. Q. To what air are the tops connected?

A. One, train pipe; the other, direct to main reservoir air.

299. Q. Has the New York a triplex governor?

A. Yes.

300. Q. How are the connections made?

A. Two of the tops are connected to the train-pipe air and set for high and low pressure, the low pressure governors' pipe has a cock located in it and is closed when the high pressure is desired, the other top cock is connected to main reservoir air,

301. Q. Any other questions you can think of applying to the New York governor?

A. No. Previous questions asked on the governor will apply to same.

302. Q. What should be done if the governor pipe connecting to the train-pipe air should be broken (triplex system)?

A. Blind the connections and regulate the governor connected to the main reservoir to the train-pipe air, plus the excess and be careful not to carry the handle in release position.

303. Q. What should be done if it was the duplex governor?

A. Handle the defect the same.

304. Q. What should be done if it was the single governor?

A. Blind the connection and regulate the pump by the globe valve.

DOUBLE HEADING

305. Q. What is the meaning of double heading?

A. Two or more locomotives, coupled together, or separated, hauling the same train.

306. Q. Can the pump, on all locomotives be used to charge the equipment?

A. Yes.

309. Q. After the equipment has been charged, what should be done?

A. The double-heading cock should be closed on all locomotives except the leading one and, handle of the valve placed in running position.

308. Q. Where is the cock you speak of located?

A. In the train pipe, just below the engineer's valve.

309. Q. What is the position of the handle when closed?

A. In line with pipe.

310. Q. When open?

A. Cross wise.

311. Q. In what position should the cock be located?

A. The position should be such when the handle is operated for closing, it should move upward.

312. Q. Can the leading engineer operate the brakes on all the locomotives?

A. Yes. He has full control of the brakes on all locomotives, same as he does on the cars.

313. Q. What would be the result if this cock was left open on all the locomotives?

A. Brakes would not apply, or remain applied, when operated by the leading engineer.

314. Q. Why not?
A. There is communication between main reservoir and train pipe on these locomotives where the double-heading cock is not closed, main reservoir air would feed into train pipe, releasing or preventing an application.

315. Q. What would be the action of the equalizing piston on the leading engine?
A. It would remain up (unseated), discharging train-pipe air until double-heading cock was closed on rear locomotive.

316. Q. Any way you know of the brakes could be applied by the leading engineer?
A. Yes; by operating the handle of the valve on No. 5 position.

317. Q. Why could the brakes be applied by operating the handle on No. 5 position?
A. The exhaust port of train pipe is larger and would discharge more air than could feed through feed port of the valves in running position.

318. Q. With the double-heading cock closed on all locomotives except the leading one, can the engineer on the locomotive, which the cock is closed on, apply the brakes?
A. Yes.

319. Q. What would have to be done?
A. Open double-heading cock and operate on No. 5 position.

320. Q. Would you lap the valve?
A. No; not until the train had come to a stop, or the leading engineer knew that there was an application being made.

321. Q. Is it advisable to lap the valve instead of closing the cock when double heading?

A. No.

322. Q. Why not, the engineer of the leading locomotive can apply the brakes just the same, can he not?

A. The brakes can be applied just the same, but, when the leading engineer wants to make the release, the excess air will lift the equalizing piston (of the valve that is lapped), discharging to the atmosphere, preventing the brakes from being released.

323. Q. How would you run the New York valve, first, second or third locomotive?

A. Same as Westinghouse.

324. Q. Where the gauge on one locomotive records a higher train-pipe pressure than the other, with the double-heading cock open on all locomotives, where is the trouble?

A. The trouble is in the gauge. They want testing.

LOCOMOTIVE BRAKES

325. Q. What is the standard breaking power of a locomotive?

A. Usually about seventy-five per cent. of the light weight on the drivers, trailers and locomotive trucks.

326. Q. How is the braking power derived?

A. By means of certain size cylinders, two for the drivers and (trailer) one for the truck, the piston contained in the cylinder acts on a set of levers, connections and beams, which distributes the brake power to each brake shoe applied to the wheels.

327. Q. Are all the brake cylinders the same size?

A. No; the size of cylinders are in proportion to the light weight of locomotives.

328. Q. Is a piston all the cylinders contain?

A. No.

329. Q. What else is there in the cylinders?

A. There is a (cup) leather packer.

330. Q. Where is the packer located?

A. It is held in the front of the piston by a follower, suitable studs and nuts.

331. Q. How is the packer held to the bore of the cylinder?

A. By a small steel ring, known as a packer expander.

332. Q. Anything else you know of in the cylinder?

A. Yes; a leakage groove, about three inches long, nine sixty-fourths inch wide and five sixty-fourths inch deep.

333. Q. Why is the leakage groove put in the cylinder?

A. To prevent the brakes from sneaking on when there is a slight leak of train-pipe air, causing piston in triple to move to applied position.

334. Q. What moves the piston back to release position after air has been discharged from cylinder?

A. There is a coil spring located around the piston rod, which re-acts, moving the piston back to normal position.

335. Q. How is the air pressure of a locomotive

brake controlled when being admitted to the brake cylinder?

A. By a plane automatic triple valve.

336. Q. What is a triple valve?

A. It is a valve having three functions (operating in three different ways).

337. Q. What is the duty (functions) or work which the triple does?

A. It operates the air between the train pipe (cross-over pipe) and auxiliary reservoir (when charging), between the auxiliary and brake cylinder (when applying), and between the brake cylinder and atmosphere (when releasing the brakes).

338. Q. Is there two triple valves located on a locomotive?

A. Not necessarily.

339. Q. Are all the triple valves the same that are used on the locomotives?

A. No; triple valves are made with ports in proportion to size of auxiliary reservoirs and brake cylinders, the brake companies have reduced to two sizes.

340. Q. Where is the braking power for a locomotive stored?

A. In the auxiliary reservoir.

341. Q. Are all the auxiliary reservoirs the same size?

A. No. They are made in proportion to size of brake cylinder.

342. Q. Is there a release (or bleed) cock in the auxiliary?

A. Yes.

343. Q. What is it used for?

A. To release the brakes on that vehicle when excess air cannot be obtained.

344. Q. How long should it be left open?

A. Until the triple valve pops.

345. Q. What does the pop of the triple valve indicate?

A. It indicates the piston has moved to release position, the brake is releasing.

346. Q. How would you cut the brakes out on a locomotive and still operate those on tender and cars?

A. There is a cut-out cock in the cross-over or branch pipe for that purpose.

47. Q. What is the position of the handle when opened?

A. Crosswise the pipe.

348. Q. Which way when closed?

A. In line with pipe.

349. Q. When the brakes are cut out on any vehicle, what should be done with the auxiliary's air?

A. It should be exhausted.

350. Q. How can the auxiliary's air be exhausted?

A. By opening the release cock and leaving it open.

351. Q. Why should it be left open?

A. To annul any possible chance of the brakes sneaking on.

352. Q. What is a cross-over or branch pipe?

A. That is the pipe connection between train pipe and triple valve.

353. Q. What is the train pipe?

A. The train pipe extends from the pilot of locomotive to the rear of train, united between locomo-

tive and tender also cars by means of flexible hose and couplings.

354. Q. In the older form of triple valve, where is the cut-out cock located?

A. It is located in the triple valve body.

355. Q. What are the positions of the handle?

A. Horizontal, automatic brake. Vertical straight air, midway between the two positions at an angle forty-five degrees for cut out.

356. Q. In the later class of this triple, could the handle be turned for straight air?

A. No; there was a lug cast on the handle.

357. Q. What would cause this class of triple to blow at exhaust port?

A. Two defects, slide valve or cut-out plug leaking.

358. Q. How could you tell one defect from the other?

A. Set the brake; if the blow continued it was in the slide valve, if the blow stopped, usually the plug.

359. Q. What will cause the present triple valve to blow at the exhaust port (where cut-out cock is located in cross-over pipe)?

A. One defect, slide valve leaking.

360. Q. Name the valves that are in a plain automatic triple valve?

A. Piston, slide and graduating valve (total three).

361. Q. On making a service reduction of train-pipe air, what is the action of the piston?

A. It moves outward to an applied position, knob of piston touching stem of graduating spring.

362. Q. What is the first thing it does when making the move?

A. Closes the feed port between train pipe and auxiliary reservoir, and at the same time dragging the graduating valve from its seat.

363. Q. What is the second thing it does?

A. Moving slide valve and closing exhaust port from brake cylinder to the atmosphere.

364. Q. What is the third thing it does?

A. Opening admission port from auxiliary reservoir to brake cylinder, applying the brakes.

365. Q. Does the piston do all the things mentioned in one move?

A. Yes.

366. Q. How long does the port remain open between the auxiliary and brake cylinder?

A. That depends on the reduction made. If the reduction was five pounds it would remain open until five pounds of air was admitted into brake cylinder from the auxiliary.

367. Q. What would be the movement?

A. The piston would move inward (back), seating the graduating valve.

368. Q. What is the action of the piston with another reduction of five pounds (total ten pounds).

A. It would move unseating graduating valve and operate five pounds more to the cylinder.

369. Q. What is the action with a reduction of five pounds more (total fifteen pounds)?

A. It would move unseating graduating valve and operate five pounds more to the cylinder.

370. Q. The action with a reduction of five pounds more (total twenty pounds)?

A. The piston would have the same action as previously described, excepting it has not any inward move, the graduating valve remains unseated and port remains open between auxiliary and brake cylinder.

371. Q. Why does the graduating valve remain unseated?

A. Because the brakes are usually full set at a twenty-pound reduction.

372. Q. What is meant by full set?

A. The auxiliary reservoir's air has been admitted to brake cylinder and the two vessels have equalized.

373. Q. When making a service application, does the piston move inward and seat the graduating valve after each reduction?

A. After the air from the auxiliary reservoir has been admitted into the brake cylinder, equivalent to the reduction in train pipe, the piston moves back and seats the graduating valve, doing so at each reduction until the brakes are full set.

374. Q. Why does the piston move back and seat the graduating valve?

A. Auxiliary reservoir air reduces a trifle below train-pipe air, just enough to overcome the friction in packing ring.

375. Q. What is the action of the piston when an excess pressure is admitted into train pipe (increasing it above that in auxiliary reservoir)?

A. Piston moves to a release position (normal).

376. Q. What is the first thing it does?

A. Closing admission port between auxiliary reservoir and brake cylinder.

377. Q. What is the next thing it does?

A. Moves slide valve, opening exhaust port to atmosphere, and opens feed port between train pipe and auxiliary reservoir.

378. Q. What is the result?

A. Release of the brakes and recharging of the reservoir.

379. Q. What would be the result if the graduating valve was leaking?

A. The brake would release.

380. Q. Why would it release?

A. On making an application (graduating valve leaking), air will continue to feed from auxiliary reservoir into brake cylinder, reducing same below train-pipe air, causing piston to move to release position, releasing the brakes.

381. Q. On making a sudden reduction of train-pipe air (emergency), what is the action of the piston?

A. The piston moves to the extreme travel, compresses the graduating spring, cutting out the graduating features and opens a large port direct from auxiliary to brake cylinder, applying the brakes.

382. Q. Are the same ports closed as when operating service?

A. Yes.

383. Q. Is there any more braking power derived?

A. Not with this class of triple.

384. Q. Is the emergency action any quicker?

A. Yes.

385. What is the difference between the Westinghouse and New York locomotive triple?

A. Not any.

386. Q. When the locomotive is equipped with truck and drive brakes, can either be cut out if they become defective?

A. Yes, there are cocks located in the pipes for that purpose.

387. Q. How many cocks should be closed if either become defective?

A. Two. One near the auxiliary reservoir, the other near the brake cylinder.

TENDER BRAKE

388. Q. What is the braking power of a tender?

A. At the present time about one hundred per cent. of the light weight.

389. Q. How is the braking power derived?

A. By the same method as on a locomotive.

390. Q. Are all the brake cylinders the same size?

A. No; the size of cylinder is in proportion to the light weight of tender.

391. Q. How is the air pressure controlled when being admitted to the cylinder?

A. By a triple valve.

392. Q. How many kinds of triple valves are there used for tender equipment?

A. Two; quick action and plain.

393. Q. Does the size of brake cylinder govern the size of triple valve?

A. Yes.

394. Q. Does the class of service the locomotive is in govern the kind of triple valve (quick action or plain)?

A. Yes.

395. Q. What is a quick action triple valve?

A. It is a valve which operates the pressure three different ways, with an additional set of valves for (accelerating) reducing train-pipe air quickly on an emergency application (triple also means three in one).

396. Q. What three valves are there in a triple (plain or quick action)?

A. Piston, slide and graduating.

397. Q. How can you distinguish one from the other?

A. The quick action triple has a check case and is usually bolted to the cylinder, the plain triple has no check case and is always fastened to the auxiliary reservoir.

398. Q. Is the cut-out cock for each kind of triple in the same location?

A. With the quick action triple and the late plain triple, the cut-out cock is in the cross-over pipe, it is located in the triple body of the old-style plain triple.

399. Q. Which way does the handle stand when open?

A. Same as the one that is used for locomotives.

400. Q. What is the difference between the operation of the quick action and plain triple (service application)?

A. Not any.

401. Q. On making a sudden reduction of train-pipe air, what is the action of a plain triple?

A. Same as the one that is applied to locomotives.

402. Q. On making a sudden reduction of train-pipe air, what is the action of the quick action triple?

A. The piston moves to extreme travel, compressing the graduating spring.

403. Q. What is the first thing the piston does when making this move?

A. Closes the feed port between train pipe and auxiliary reservoir and at the same time dragging graduating valve from its seat (same as when in service).

404. Q. What is the second thing?

A. Moving slide valve, closing exhaust port from brake cylinder to atmosphere.

405. Q. What is the third thing?

A. Compressing graduating spring, cutting out graduating features.

406. Q. What action takes place?

A. The opening of port from auxiliary reservoir to the emergency piston.

407. Q. What is the action of the emergency piston?

A. The auxiliary air moves it down and at the same time unseating the emergency valve.

408. Q. Unseating of the emergency valve discharging what air?

A. The volume of air (between emergency and check valve) on top of check valve.

409. Q. What is the action of the check?

A. It raises.

410. Q. What air raises it?

A. Train-pipe air.

411. Q. Where does train-pipe air discharge?
A. Into brake cylinder.

412. Q. What becomes of the air in the auxiliary reservoir?
A. That follows in (brake cylinder) through tail port of slide valve.

413. Q. Is the brake power increased?
A. Yes, about ten pounds or twenty per cent.

414. Q. What is the action or ports operated in the quick action or plain triples, located on tenders, when the release occurs?
A. Same as the triple on the locomotive.

415. Q. Which would release first, quick action or plain triple?
A. Plain triple has a tendency to.

416. Q. Why?
A. As there is fifty pounds in the auxiliary reservoir instead of sixty pounds, which is obtained in the quick action triple.

417. Q. Name the valves and pistons in a Westinghouse quick-action triple.
A. Piston, slide, graduating, emergency and check valve and emergency piston.

418. Q. The braking power for a tender is stored where?
A. In the auxiliary reservoir (same as that of a locomotive).

419. Q. Are the auxiliary reservoirs all the same size?
A. No; they are governed by the size of brake cylinder.

420. Q. What is the standard braking power of a passenger car?

A. Ninety per cent. of the light weight.

421. Q. What is the standard braking power of a freight car?

A. Seventy per cent. of the light weight.

422. Q. Do you know of cases where the braking power has been arranged for ninety-five per cent. of the light weight (passenger service)?

A. Yes, and good results obtained.

423. Q. Do you know of cases where the braking power has been arranged for eighty per cent. of the light weight (freight service)?

A. Yes, with good results.

424. Q. How is the braking power derived for a car?

A. By means of a brake cylinder, same as on a locomotive or tender.

425. Q. Are all the cylinders the same size?

A. No; the size of cylinder is in proportion to weight of car.

426. Q. What kind of triple valves are used in passenger and freight service?

A. Quick-action triple.

427. Q. Are all triple valves the same?

A. No; the size of ports are governed by the size of auxiliary reservoirs and cylinders.

428. Q. Are the size of auxiliary reservoirs the same?

A. No; they are governed by the size of brake cylinders.

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429. Q. What is the duty of an auxiliary reservoir?

A. The auxiliary reservoir performs the same duty for a car as it does for a locomotive or tender.

430. Q. Can the brakes be cut out on a car without interfering with the others?

A. Yes; there is a cut-out cock for that purpose, same as on locomotive or tender.

431. Q. What is the action or the operation of a quick-action triple valve applied to a car?

A. The same as the quick-action triple applied to tenders.

432. Q. How many classes of quick-action triples are there?

A. Four. Two for passenger and two for freight.

433. Q. What would be the action if a passenger triple should be applied to a freight auxiliary?

A. When charging the auxiliary reservoir it would charge quicker than other auxiliaries; when applying, the brake would set quicker. It also would release quicker, either would it be as sensitive on an emergency application.

434. Q. What would be the action if a freight triple be applied to a passenger cylinder?

A. The auxiliary would be very slow in charging, also the release of the brake would be very slow and a tendency for the triple to operate quick action (emergency) when service was desired.

435. Q. Then it is very necessary for the triple to be applied to the proper size of cylinder?

A. Yes, and the proper size of auxiliary also.

436. Q. How can you distinguish a freight from a passenger triple?

A. Usually by the freight triple having two exhaust ports.

437. Q. Have you ever seen a freight triple with one exhaust port?

A. Yes, there are a few and they usually get in passenger service.

438. Q. Is there any other way of noting the difference?

A. Yes; by the diameter of the slide-valve bushing.

439. Q. What should the slide-valve bushing measure?

A. F-36 freight, one and one-quarter inches, diameter; F-27 passenger, one and three-eighths inches, diameter; F-29 passenger, one and three-fourths inches, diameter.

440. Q. How long does it take to charge an auxiliary reservoir, from empty to seventy pounds, from a seventy-pound train-pipe pressure?

A. From about one to two minutes.

441. Q. Why does it take so long?

A. Because the feed port in the triple is small (forced feed).

442. Q. Why is the feed port in the triple valve made so small?

A. They are made small that the auxiliary reservoir may all charge of an equal, that the brakes can be applied and released as near uniform as possible.

443. Q. Has the present brake companies any means of recharging the auxiliary reservoirs while the brake remains set (applied)?

A. Yes.

444. Q. What means is it?

A. Pressure retaining valve.

445. Q. Does the pressure retaining valve control the recharging of the auxiliary reservoir?

A. No; it controls the exhaust when the brake is releasing.

446. Q. Where is the pressure retaining valve connected?

A. To the exhaust port of the triple by a three-eighth inch pipe.

447. Q. When is it in operation?

A. When the handle is turned crosswise.

448. Q. Explain the action when the handle is crosswise?

A. When the brake is releasing, (the exhaust) air lifts the weight and discharges to the atmosphere (through a five-sixty-fourth-inch port), reducing the air in the brake cylinder very slowly to about sixteen pounds, the weight then seats, retaining that amount in brake cylinder.

449. Q. What takes place then?

A. The brakes remain set, steadying the train while the auxiliary reservoirs recharge.

450. Q. Explain the action when the handle is in line (vertical position)?

A. The valve has not any retaining feature, exhaust of cylinder air discharges direct to the atmosphere.

451. Q. Is there air in the retaining valve and pipe at all times when auxiliary is charged?

A. No; only when the brake is releasing.

452. Q. What is a retaining valve used for?

A. For steadying the train down, long continuous grades, keeping the brakes set while the auxiliary reservoirs recharge.

453. Q. Do pressure retaining valves leak?

A. No. The continual blow you hear at times denotes a defective triple.

454. Q. In case of a continual discharge of air from the pressure retaining valve, what should be done?

A. Cut the brakes out on that car and open the release cock (bleeder).

455. Q. Why would you cut the brakes out?

A. The brake would either set with a greater pressure than the others or release.

456. Q. Why would you open the release cock (bleeder), when cutting a brake out?

A. To annul any possible chance of the brake creeping on.

457. Q. How would you cut the brake out?

A. By the cock located in the cross-over pipe.

458. Q. If the pressure retaining valve was gone (missing), would you run the car with the brakes cut in?

A. Yes. Pressure retaining valve missing does not interfere with the operation of the brake.

459. Q. If the brakes on a car could not be released, what would you examine?

A. Pressure retaining valve, seeing if the handle was in line with pipe and, if so, I would then disconnect the retaining valve pipe.

460. Q. Why would you disconnect the pipe?

A. There are times when retaining valve or pipe gets plugged.

461. Q. Would you connect the pipe again, after the brake was released?

A. Not if the pipe had not been cleaned.

462. Q. Are all freight cars equipped with a retaining valve?

A. Yes.

463. Q. Are all passenger cars equipped with a retaining valve?

A. No; they are only used in passenger service on roads that have heavy grades.

464. Q. Are all locomotives and tenders equipped with retaining valves?

A. No. Some roads use them; others do not.

CONDUCTOR'S VALVE

465. Q. Can the brakes be applied from any passenger car of a train?

A. Yes, by the conductor's valve.

466. Q. Can the brakes be applied with either application (emergency or service) by the operation of conductor's valve?

A. Yes.

467. Q. How should it be operated for an emergency?

A. Open it quickly and leave it open until the train stops.

468. Q. How should it be operated for a service application?

A. Open it slowly, allowing the pressure to discharge gradually.

469. Q. How many styles of conductor's valves are they?

A. Two. One is automatic in closing; the other is not.

NEW YORK QUICK-ACTION TRIPLE VALVE

470. Q. On making a service reduction of five pounds, what is the action of the piston?

A. As the reduction occurs of train-pipe air, so is the volume in the cylindrical piston (back of vent valve piston) reduced also, the piston moving the full travel, vent valve piston remaining stationary.

471. Q. What is the first thing the piston does when making the move?

A. Closing the feed port between train pipe and auxiliary reservoir and at the same time moving graduating (slide) valve.

472. Q. What is the second?

A. Moving slide valve and (graduating slide valve) closing exhaust port from brake cylinder to atmosphere.

473. Q. What is the third?

A. Opening admission port between auxiliary reservoir and brake cylinder, applying the brakes.

474. Q. How long would the port remain open?

A. If the reduction was five pounds it would remain open until five pounds of air was admitted from the auxiliary to brake cylinder.

475. Q. What would be the movement?

A. The piston would move inward, moving graduating slide valve, closing the port.

476. Q. What is the action of the piston on making another five-pound reduction (total ten pounds)?

A. It would move graduating valve, operating five pounds more from auxiliary to cylinder.

477. Q. What would be the action of the piston on making another five-pound reduction (total fifteen pounds)?

A. It would move graduating valve, operating five pounds more from auxiliary to cylinder.

478. Q. What would be the action with another five-pound reduction (total twenty pounds)?

A. The piston would have the same movement as previously described, excepting it has not any inward movement, the port remains open between the auxiliary and brake cylinder.

479. Q. The action is the same as a Westinghouse, is it not?

A. Yes. Only difference is, graduating port is operated by a small slide valve.

480. Q. What will be the result if the graduating valve leaks?

A. The brake will have a premature release, same as the Westinghouse. Triple will also blow at exhaust port when brakes are released.

481. Q. On making a sudden reduction of train-pipe air, what is the action of the triple?

A. The piston moves in the same position as it does in a service application, operating the same ports, but the air that is stored in the cylindrical piston (back of vent-valve piston) cannot be reduced as quick as train-pipe air, the vent-valve piston is also moved at the same time.

482. Q. The piston cannot move on an emergency application without operating the vent-valve piston, can it?

A. No.

483. Q. What valve is operated by the vent-valve piston?

A. The vent valve.

484. Q. What air does the vent valve discharge?

A. Train-pipe air.

485. Q. Where does it discharge?

A. To the atmosphere (and to their high-speed valve, if car is equipped) and emergency piston at the same time.

486. Q. What is the action of the emergency piston?

A. It is moved inward, unseating the emergency valve.

487. Q. What port does the emergency valve operate?

A. A large port between auxiliary reservoir and (cylinder check valve, forcing it from its seat, air entering) brake cylinder.

488. Q. Is there any more brake power derived by the emergency, than by a service application?

A. No; not with a New York triple.

489. Q. Why not?

A. To get more brake power, the train-pipe air would have to be admitted to the cylinder, in this class of triple it is vented to the atmosphere.

490. Q. When does the cylinder check valve seat?

A. When the air in the auxiliary and brake cylinder has about equalized.

491. Q. What seats it?

A. Its spring.

492. Q. When does the emergency valve seat?

A. When the auxiliary and brake cylinder has about equalized.

493. Q. What seats it?

A. Its spring.

494. Q. Any other action the spring performs?
A. Yes; moving the emergency piston back to normal position.

495. Q. When does the vent valve seat?
A. When the power of the vent-valve spring overcomes the power generated by its piston.

496. Q. How are the brakes released?
A. By admitting an excess pressure from the main reservoir into the train pipe, increasing it above that in auxiliary, causing piston to move to release position, same as Westinghouse.

WESTINGHOUSE QUICK-ACTION TRIPLE

497. Q. When does the check valve rise?
A. It rises at all times, when the train pipe is being charged and on an emergency application.

498. Q. After making an emergency application, when does the check valve seat?
A. When the air in train pipe and cylinder has about equalized.

499. Q. What seats it?
A. Its spring.

500. Q. When does the emergency valve seat?
A. When the air in the auxiliary and cylinder has about equalized.

501. Q. What seats it?
A. The same spring.

502. Q. Anything else this spring acts on?
A. Yes; the emergency piston is moved to normal position, when the emergency valve is moved to its seat.

DUTY OF TRIPLE VALVE PARTS

WESTINGHOUSE.

503. Q. What is the duty of the triple piston?

A. To operate the port between train pipe and auxiliary reservoir, also the graduating and slide valve.

504. Q. Duty of the slide valve?

A. To operate the exhaust and assist in operating the port between auxiliary and cylinder (service application), to operate the port between auxiliary and emergency piston and between auxiliary and cylinder (emergency application).

505. Q. Duty of the graduating valve?

A. To operate the air from auxiliary to cylinder, as reduction is made in train pipe (service) until the brakes are full set.

506. Q. Duty of the emergency piston?

A. To operate emergency valve.

507. Q. Duty of emergency valve?

A. To operate the port between train pipe and brake cylinder on an emergency application.

508. Q. Duty of the check valve?

A. To prevent a back flow of air from brake cylinder to train pipe whenever cylinder is above train-pipe air.

509. Q. Duty of the graduating spring?

A. To assist the graduating valve in making a service application.

DUTY OF TRIPLE VALVE PARTS

NEW YORK.

510. Q. Duty of triple piston?
A. Same as Westinghouse.

511. Q. Duty of slide valve?
A. To operate the exhaust port.

512. Q. Duty of graduating valve?
A. Same as Westinghouse.

513. Q. Duty of vent-valve piston?
A. To operate vent valve.

514. Q. Duty of vent valve?
A. To operate the port between train pipe and atmosphere.

515. Q. What work is performed by the train-pipe air exhausting to the atmosphere?
A. It acts on the emergency piston, also on their high-speed reducing valve.

516. Q. Duty of emergency piston?
A. To operate the emergency valve.

517. Q. Duty of the emergency valve?
A. To operate the port between auxiliary and cylinder (unseating check valve).

518. Q. Duty of check valve?
A. To prevent back flow of air from cylinder.

519. Q. Duty of vent-valve spring?
A. To seat vent valve and assist in operating service application.

TRIPLE BLOWS AT THE EXHAUST PORT

WESTINGHOUSE.

520. Q. How many defects are there which will cause a quick-action triple to blow at the exhaust?
A. Four.

521. Q. Name them?

A. Emergency valve rubber or its seat, or check-case gasket, triple-valve gasket broken through to port and slide valve.

522. Q. If a triple valve is blowing at exhaust and, on cutting the brakes out on that car, the brakes apply, what defect would that indicate?

A. Leak at emergency valve rubber, seat, or check-case gasket.

523. Q. If there is a blow at exhaust when brake is applied, what defect would that indicate?

A. Leaky slide valve.

524. Q. If there is a blow at the exhaust when brake is released (not when applied) and you have cut the brakes out on the car, knowing it is not the emergency device, what defect would that indicate?

A. Usually triple valve gasket leaking, though some times it is the slide valve.

NEW YORK

525. Q. How many defects are there that will cause a quick-action triple to blow at exhaust port?

A. Three.

526. Q. Name them?

A. Slide and graduating valve leaking, also triple valve gasket broken through to port.

527. Q. How would you test for a leaky slide valve or gasket?

A. Same as I would in Westinghouse.

528. Q. How would you detect a leaky emergency valve?

A. There would be a blow at the inner vent port of train-pipe exhaust, when brakes was either applied or released.

529. Q. How would you detect a leaky check valve?

A. There would be a blow at inner vent port, train-pipe exhaust when brakes were applied.

530. Q. How would you detect a leaky vent valve or its seat?

A. There would be a continual blow at the outer vent port train-pipe exhaust.

AUTOMATIC ACTION

531. Q. What makes the system automatic (service)?

A. Because the construction of the triple valve is such, when the train-pipe air is reduced below that in the auxiliary reservoir, from any cause, it causes the piston to move to an applied position, opening communication between auxiliary reservoir and brake cylinder, applying the brakes.

532. Q. What makes the system quick acting (emergency)?

A. Because the construction of the triple valve is such when the train-pipe air is reduced suddenly below that in auxiliary reservoir, from any cause, there is an action taking place in the triple (Westinghouse, which opens a large port between train pipe and brake cylinder, causing a sudden reduction of train-line air which acts upon the following triple), (also between auxiliary reservoir and brake cylinder), (New York, which opens a large port between train pipe and atmosphere, causing a sud-

den reduction of train-pipe air which acts upon the following triple. Also opening a large port between auxiliary and cylinder), applying the brakes as quickly as possible.

533. Q. Do you understand the features of a quick-action brake (emergency) is to accelerate (reduce) the train-pipe air as quickly as possible?

A. Yes. If the triple valve did not reduce the train-pipe air the quick action could not operate.

534. Q. Where does the Westinghouse vent its train-pipe air?

A. To the brake cylinder.

535. Q. Where does the New York vent its train-pipe air?

A. To the atmosphere.

536. Q. What causes the piston of the brake cylinder to move so quickly upon an emergency?

A. Westinghouse: Rapid admission of train-pipe air. New York: Rapid admission of auxiliary reservoir air.

HIGH PRESSURE CONTROL

537. Q. What is the high pressure control?

A. The high pressure control is only used on a locomotive and tender, where the grades are heavy and they haul empty cars ascending (going up), and loaded, descending (going down).

538. Q. What necessary equipment must be applied to convert the ordinary brake into a high pressure control?

A. Two safety valves, one applied to driver brake cylinders, the other to tender brake cylinder. A duplex governor, a reversing cock, bracket, and a feed valve.

539. Q. To what pressure are the governor tops connected?

A. The governor top which operates the governor at one hundred and twenty pounds is connected direct to main reservoir air, the one that operates at ninety pounds is connected to top of reversing cock.

540. Q. Why is the ninety-pound top connected to top of reversing cock instead of the brake valve, same as ordinary duplex governor?

A. If it was connected to the engineer's valve, it could not be cut out at the changing from to low to high pressure feed valve.

541. Q. Why do you want to cut out the low pressure governor when changing from seventy pounds to ninety pounds.

A. To obtain one hundred and twenty pounds main reservoir air.

542. Q. Which is the high and low pressure feed valve?

A. Low pressure is located on left side of the reversing cock, high pressure, right side.

543. Q. Would you run high pressure when handling a train of empty cars?

A. No. A heavy application has a tendency to slide the wheels.

544. Q. How many pounds of a reduction would it require (ninety pounds train-pipe air) to set the brakes in full, piston travel about eight inches?

A. About twenty-five pounds.

545. Q. What could be done if the ninety-pound feed valve was found defective and you desired to handle the train with that pressure?

A. Regulate the seventy-pound valve for the high pressure.

546. Q. What would be main reservoir air?
A. Ninety pounds.

547. Q. Why so?
A. Ninety-pound governor is not cut out.

548. Q. What should be done to accumulate the one hundred and twenty-pound main reservoir valve air (handle on valve in running position)?
A. Regulate the ninety-pound governor to one hundred and twenty pounds, report it and feed valve on arrival at terminal.

549. Q. What is the duty of the safety valve?
A. To exhaust the air from the brake cylinder whenever it exceeds the maximum.

550. Q. What is that done for?
A. To prevent the wheels of the locomotive and tender from sliding.

HIGH-SPEED BRAKE (PASSENGER SERVICE)

551. Q. What is it?
A. It is the ordinary quick-action brake re-inforced.

552. Q. How is it re-inforced?
A. By carrying a higher pressure.

553. Q. What are the pressures?
A. One hundred and ten pounds train pipe and auxiliary reservoir, one hundred and twenty pounds main reservoir (where the train is long, one hundred and thirty pounds main reservoir).

554. Q. Why does not the braking power derived from one hundred and ten pounds slide the wheels?

A. The train is equipped with the necessary parts for the high-speed feature.

WESTINGHOUSE

555. Q. What necessary equipment must be applied to a locomotive to convert the ordinary brake into the high speed?

A. One high-speed automatic reducing valve; one duplex governor and its cock; one reversing cock and bracket; one feed valve and the standard triple.

556. Q. What necessary equipment applied to the tender?

A. One automatic high-speed reducing valve and standard triple.

557. Q. What necessary equipment applied to a car?

A. One automatic high-speed reducing valve.

558. Q. Assuming you are running low speed, what would you do to run high speed?

A. Change the reversing cock, cutting in the one hundred and ten-pound feed valve, close the cock in the governor pipe, leading to the low pressure governor, the high pressure governor would then control the pump.

559. Q. Which is the high and low pressure feed valve?

A. Low pressure is located to the left side of reversing cock; high pressure, right side.

NEW YORK

560. Q. What necessary equipment must be applied to a locomotive to convert an ordinary brake into high speed?

A. One compensating valve; one triplex governor and its cut-out cock, and the standard triple.

561. Q. What pressures is the governor tops connected to?

A. One to main reservoir air; two to train-pipe air (one having a cock located in its pipe).

562. Q. What pressure are the governor tops set for?

A. The one that has the cock in its pipe is regulated for seventy pounds, its mate, one hundred and ten pounds; one connected to the main reservoir, one hundred and thirty pounds.

563. Q. What necessary equipment applied to the tender?

A. One compensating valve and standard triple.

564. Q. Assuming you are running low speed, what would you do to run high speed?

A. Close the cock in the seventy-pound governor pipe.

WESTINGHOUSE

565. Q. What is the duty of the automatic high-speed reducing valve?

A. To graduate the discharge of air from the brake cylinder to the atmosphere on an emergency application, reducing the brake power to normal (sixty pounds), preventing the wheels from sliding.

566. Q. Any other duty it performs?

A. Yes, it reduces the brake cylinder pressure at all times whenever it exceeds sixty pounds, service or emergency application.

567. Q. When is the feature of the high-speed automatic reducing valve in operation?

A. On an emergency application.

568. Q. Why is it not in operation on a service application?

A. Because the feature of the apex port is not being performed.

569. Q. Explain the operation of the high-speed valve?

A. Brake cylinder air has direct communication with top of its piston at all times, at the time of an emergency application (one hundred and ten pounds), the auxiliary and brake cylinder equalize at about eighty-five pounds, which moves the piston to the extreme travel, moving with it the slide valve, bringing in communication the upper end of apex port (of triangular shape, which is located in slide valve) with the small oblong port (which is located in the seat), exhausting the pressure to the atmosphere slowly, as the pressure reduces the adjusting spring located under piston begins to re-act, moving piston upward, same time moving slide valve, gradually opening the apex port a little larger, discharging the pressure more rapidly, until brake power has been reduced to about sixty pounds, at which time the slide valve laps the port (closing the apex), retaining sixty pounds of brake power.

570. Q. What pressure is the high-speed valve set at?

A. They are set to retain sixty pounds.

571. Q. Are all the high-speed valves the same?

A. No, they are made with an exhaust port in proportion to size of cylinder.

572. Q. What is the time required to reduce the brake power from eighty-five to sixty pounds?

A. About seventeen seconds.

573. Q. How is the high-speed valve adjusted?

A. By the removal of the cap nut and turning the adjusting plug.

574. Q. Should a car not equipped with a high-speed brake be run in a train and operated with a high pressure?

A. No. There is a tendency to slide the wheels.

575. Q. Would all the cars in the train have to be equipped with an automatic reducing valve?

A. No. Those not equipped could temporarily be equipped with a safety valve.

576. Q. Can a car equipped with a high-speed brake be run in a train and operated with a low pressure brake?

A. Yes.

577. Q. What is the advantage of the high-speed brake?

A. First, a train can be stopped in much shorter distance; second, in running through yard limits, an engineer can make several slow downs, yet having air enough to produce the braking power derived from making an emergency with the low pressure.

578. Q. How many good service applications can be made from the high-speed pressure, yet retaining standard low pressure, piston travel about eight inches?

A. Three.

579. Q. Is there any more braking power derived by making a reduction of five pounds with the high pressure, than with the low pressure brake?

A. No. The braking power derived is the same in each case.

580. Q. How would you proceed if the one hundred and ten-pound valve became defective?

A. Cut low pressure feed valve in and regulate it to one hundred and ten pounds.

581. Q. How would you proceed if one hundred and twenty-pound governor became defective?

A. Adjust the ninety-pound governor for one hundred and twenty pounds, or vice versa.

582. Q. What should be done if the pipe was broken between the high-speed valve and brake cylinder?

A. Disconnect the piece entering cylinder and use a safety valve.

583. Q. If you could not obtain a safety valve, what would you do?

A. Plug the hole in the cylinder head, reducing from high to low pressure and report the defect on arrival.

584. Q. How would you proceed to reduce to low pressure?

A. Change the reversing cock from high to low pressure, make a reduction, reducing train-pipe air from one hundred and ten pounds to fifty-five pounds, allowing about thirty seconds before releasing.

NEW YORK COMPENSATING HIGH-SPEED VALVE

585. Q. When the New York valve is used with its own equipment, how are the connections made?

A. One connection is made to the cylinder (same as Westinghouse); the other is made to the cap of the emergency piston (triple valve).

586. Q. Does this valve graduate the exhaust of air from brake cylinder on an emergency application?

A. No. The braking power is reduced at the same rapidity from start to finish.

587. Q. What controls the exhaust port?

A. The piston.

588. Q. What pressure is the valve set at?

A. To retain sixty pounds, same as Westinghouse.

589. Q. How is the valve adjusted?

A. By the same method as the Westinghouse.

590. Q. How would it be connected to a foreign brake?

A. In the same manner as a Westinghouse.

591. Q. Would it perform the same feature?

A. No.

592. Q. Why not?

A. The Westinghouse graduates the exhaust; the New York does not.

593. Q. Explain the operation of the New York compensating valve when it is connected to its own equipment?

A. On an emergency application the New York triple valve vents the train-pipe air to the atmos-

phere, the (lower section of) high-speed valve being connected to the (emergency piston) cap, the train-pipe air is vented into the lower section (where adjusting spring is located) and cannot escape, only as it feeds to the atmosphere through a small port, the top of piston being in direct communication with the brake cylinder at all times, there is brake cylinder air on top of the piston, the adjusting spring underneath assisted by vented air from train pipe, the piston is held to its normal position, until the air which is in lower section (with the spring) escapes to the atmosphere (time about five seconds), the air in the brake cylinder then moves the piston down, opening the exhaust (series of small ports), the brake power reducing to sixty pounds, the adjusting spring re-acts, moving the piston up (normal position), closing the ports.

594. Q. Does the New York high-speed valve reduce the brake power immediately on equalization at an emergency application?

A. No, it does not; the full braking power is held for a short period of time (about five seconds).

595. Q. What should be done if the pipe connection was broken, leading from the (emergency piston) cap to the compensating valve?

A. Not anything. Report it on arrival at terminal.

596. Q. That would interfere with the high pressure, would it not?

A. No. The valve would not retain the full braking power for a short period of time, otherwise it would operate.

597. Q. What should be done if the pipe was

broken between the compensating valve and the brake cylinder?

A. Same as a Westinghouse.

598. Q. Are all the compensating valves made the same?

A. Yes. The New York Air Brake Company makes the change for different size cylinder in the port in union stud.

STRAIGHT AIR BRAKE

599. Q. Where is the braking power stored for a straight air brake?

A. In the main reservoir.

600. Q. How is it operated?

A. By admitting air direct from the main reservoir into brake cylinder when applying, and exhausting the air from the brake cylinder to the atmosphere when releasing.

601. Q. Is there an engineer's valve for the straight air brake?

A. Yes.

602. Q. How many positions are there in the quadrant of the valve?

A. Three.

603. Q. Name them?

A. Release, lap, and application.

604. Q. When the valve is located side of boiler, which is release, lap, and application position?

A. Release position is first (forward); lap is second (center); application, third (rear).

605. Q. When operating the straight air brake, what is the maximum number of pounds of air allowed for braking power?

A. Forty-five pounds.

606. Q. What prevents the cylinder pressure from equalizing with the main reservoir air?

A. A reducing valve.

607. Q. Is the straight air brake used on the locomotive or cars?

A. On locomotive and tender.

608. Q. What are the necessary parts required for the equipping of a locomotive and tender?

A. Two safety valves, two double check valves, one reducing valve and bracket, one engineer's valve.

609. Q. Where are the safety valves located?

A. One to the driver brake cylinders, the other to the tender cylinder.

610. Q. What pressure are they set at?

A. To about fifty-two pounds.

611. Q. What is their duty?

A. To exhaust the air from the cylinder, should it exceed the maximum pressure.

612. Q. What is the engineer's valve used for?

A. For operating air between main reservoir and brake cylinder when applying, and between the brake cylinder and atmosphere when releasing.

613. Q. Where is the reducing valve located?

A. In the cab in some convenient place between main reservoir and valve.

614. Q. What is its duty?

A. To regulate or govern the cylinder air for the straight air brake.

615. Q. Where is the double-check valve located?

A. In the induction pipe of the automatic brake, near the driver and tender cylinder.

616. Q. What is its duty?

A. To prevent the brake cylinder air from escaping to the atmopshere (through the straight air engineer's brake valve), when the automatic brake is being applied, also to prevent the brake cylinder air from escaping to the atmosphere (through the automatic triple valve), when the piston is in release position or the triple cut out.

617. Q. In what position should the handle of the engineer's straight air valve be carried, when straight air brake is not in use?

A. In release position.

618. Q. Why should it be carried in release position?

A. If the handle is carried on lap, an application being made with the automatic brake and the double check valve is leaking, air will leak by it, accumulating pressure between it and engineer's valve, at the release of the automatic brakes, the brakes will remain set, as the pressure accumulated by the leakage will change the position of the double check.

619. Q. How can the brakes be released?

A. By placing the handle of straight air valve in release position.

620. Q. When the straight air brake cannot be released by the operation of its valve, how can it be released?

A. Make an automatic application.

621. Q. Why would you make an automatic application?

A. To change the position of the piston in the automatic triple valve (from applied to release position).

622. Q. Why should there always be an excess pressure in the main reservoir, when the straight air brake is operated?

A. If the air in main reservoir and train pipe has equalized and the straight air brake is operated, main reservoir air will be reduced that having a tendency to reduce train-pipe air, it will change the position of the piston in the triple valve and prevent the straight air brake from releasing properly, if the double check valve is leaking.

623. Q. What should be done if the pipe was broken between the double check and triple valve?

A. Cut out the automatic brake and go on.

624. Q. Can you operate the straight air?

A. Yes.

625. Q. What should be done if the pipe was broken between straight air engineer's valve and double check valve?

A. That would not interfere with the automatic brake, the pipe could be plugged, retaining the use of the straight air on the remaining vehicle.

READING OF THE DUPLEX GAUGE

626. Q. What are the standard pressure registered for the low pressure brake?

A. Seventy pounds, train pipe; ninety to one hundred pounds, main reservoir; duplex governor, one hundred and thirty pounds.

627. Q. The standard pressures for high pressure brake?

A. One hundred and ten pounds, train pipe; one hundred and twenty to one hundred and thirty pounds, main reservoir.

628. Q. Where is the seventy pounds stored?

A. Train pipe, equalizing and auxiliary reservoirs.

629. Q. On making a reduction of ten pounds, what does the black hand on the gauge record?

A. Sixty pounds.

630. Q. Where is the sixty pounds?

A. Equalizing reservoir, train pipe and auxiliary.

631. Q. How was the ten pounds reduced from the equalizing reservoir?

A. By the engineer.

632. Q. How was the ten pounds reduced from the train pipe?

A. By the equalizing piston, (Westinghouse); by the engineer and cut-off valve, (New York).

633. Q. How was the ten pounds reduced in the auxiliary reservoir?

A. By the graduating valve.

634. Q. Where did it feed?

A. Into the brake cylinder and applied the brakes.

635. Q. On making another reduction of ten pounds, how much will there be in the auxiliary?

A. About fifty pounds.

636. Q. On making another reduction of ten pounds, how much will there be in the auxiliary?

A. About fifty pounds (piston traveling about eight inches).

637. Q. How much will there be in the equalizing reservoir and train pipe?

A. About forty pounds.

638. Q. Why does not the auxiliary reduce to forty pounds?

A. Because on making a reduction of twenty pounds, with the brake piston traveling eight inches, the auxiliary and cylinder will equalize at fifty pounds (fifty pounds in each).

639. Q. How much air has been wasted at this application?

A. Ten pounds.

640. Q. Does wasting the ten pounds from the train pipe assist you when releasing?

A. No; it is a disadvantage, as it requires more air from the main reservoir to fill the train pipe before the brakes will release.

641. Q. Does the black hand on the gauge record the auxiliary reservoir air at all times when it is at rest.

A. No, it does not.

642. Q. When does it record it?

A. Until the brakes are full set, after that it records the amount of air wasted from train pipe.

643. Q. Black hand on gauge records seventy pounds (system charged) on making a reduction of ten pounds, what air is in the auxiliary reservoir?

A. Sixty pounds.

644. Q. Handle of valve is placed to release position and immediately brought back to lap (short passenger train), how much air is in the auxiliary reservoir?

A. Sixty pounds.

645. Q. How much does the gauge record?

A. About the same.

646. Q. Does the gauge denote what is in the auxiliary reservoir?

A. Yes; also train pipe and auxiliary is about equal.

647. Q. On making another reduction of about ten pounds, how much is in the auxiliary?

A. About fifty pounds.

648. Q. On making another reduction of about ten pounds, how much is there in the auxiliary?

A. About forty pounds, and the brakes are full set.

649. Q. Why did the auxiliary reduce to forty pounds?

A. There were two applications made.

650. Q. The handle is now placed in full release position, the black hand is recording seventy pounds, how much air is in the auxiliary?

A. The auxiliary is recharging from forty pounds.

651. Q. Why is there not seventy pounds in it, same as the gauge records?

A. Because the feed port in the triple valve is small (forced feed), it requires time to recharge.

652. Q. How can you tell what is in the auxiliary?

A. By placing the handle of valve on lap and waiting for the black hand to become stationary; when it becomes stationary, it denotes the air in the auxiliary reservoir; if it continues to fall back and the brakes apply, that denotes leakage in train-pipe air.

653. Q. Explain the meaning of application?

A. The first reduction forms the application, each and every reduction (after the application is formed, brakes applied), increases that one application until the brakes are full set, and would be termed one application made by a number of reductions.

654. Q. After you have made the first reduction

(applying the brakes), and you make another, is that an application or a reduction?

A. It is a reduction increasing the application that is on.

655. Q. What is a second application?

A. The second application is where the brakes are applied twice to make a stop or slow down.

656. Q. How would you proceed to make the second application?

A. I would move the handle from lap to release position and return it to lap.

657. Q. Why would you lap the valve?

A. To keep train pipe and auxiliary reservoir air as near equal as possible.

658. Q. Can you tell by the gauge if the train pipe and auxiliary air is about equal?

A. Yes; if the black hand (after I release the brakes and lap the valve) records about the same pressure as it did when brakes were applied, equalization is there and brakes will immediately apply when a reduction is made.

659. Q. Can the same information be obtained from the black hand, when high pressure is carried?

A. Yes.

BRAKE TESTS

660. Q. How many styles of tests are there?

A. Three.

661. Q. Name them?

A. Terminal, running, and road.

662. Q. Describe how a terminal test should be made?

A. After the locomotive is coupled on all hose being coupled and cocks opened, except the cock at rear end (rear hose hung up in dummy if car is equipped with same). The air will be turned in from the locomotive, charging the equipment (best results are obtained by waiting for the standard pressure to be accumulated in train pipe and auxiliary reservoir, whether it be high or low pressure), make an examination for leakage (if the train has not been tested by yard plant). After the leakage has been remedied (if there is any), a standard signal, such as is used by the railroad company, should be given to apply the brakes, a reduction of seven to nine pounds should be made from the engineer's valve, the engineer will note the discharge, another reduction can be made after the discharge stops if desired. Another examination is made, ascertaining if all the brakes are applied, seeing that levers do not bear on their carrier irons, also seeing if the shoes are up to the wheels, and note piston travel of each brake. After this has been ascertained, a standard signal (of the road) will be given to release, another examination will be made to see if all brakes have released.

663. Q. If you find a lever bearing on the carrier iron, what should be done?

A. If the piston was traveling standard, let out the slack taken up by the body rods and take it up with the lower rod of the trucks. If the piston was of long travel, take up the slack with the lower rod of the trucks.

664. Q. Describe a running test?

A. A running test is an application of the brakes made while the train is in motion and should be

practiced to know the actual braking quality of the train.

665. Q. When should it be made?

A. It should be made within one half mile after leaving all terminals or at any place along the road, whenever there has been any change made or work done on the brake equipment; also practice within a safe distance, one or one and one half miles of yard limits, railroad crossings, draw bridges and all other hazardous places.

666. Q. Describe a road test?

A. A road test is a test of the brakes applied to the train after the locomotive has been coupled on after being detached or any change made in the air-brake equipment of the train for any cause. The application being made from the engineer's valve, the crew ascertaining if the brake operate in forward and rear of train.

BRAKE ADJUSTMENT

667. Q. How is the slack taken up in the outside equalize driver brakes?

A. By means of the adjusting bolt and its yoke.

668. Q. When should the slack be taken up?

A. Slack should be taken up when the piston travel exceeds eight inches.

669. Q. When taking up the slack, what should be the shortest limit for piston travel?

A. Four inches.

670. Q. How is the slack taken up of the cam-driver brake?

A. By placing a seven-eighths or one-inch nut between the cross head (applied to piston rod) and

cylinder head, slacking off on all set screws, slacking the bolts or nuts of shoe wear equalizers, operating cam-screw nuts until shoes are applied to the wheels, particular attention given to cam links, seeing that they are in line, now adjusting the shoe wear equalizers, tighten all set screws, apply the brakes and piston travel will be about two or two and one half inches.

671. Q. How is the slack taken up in a tender brake?

A. By the lower rod of the trucks and adjust the piston travel by the dead lever.

672. Q. What distance is a nice piston travel for a tender?

A. Five to seven inches.

673. Q. How is the slack in brakes taken up on a passenger car (six-wheel truck)?

A. By the lower rod of the trucks and at times holes in the body rods are used to adjust the piston travel. A turn buckle in the lower rod of the truck is very convenient for the purpose.

674. Q. How is the slack in the brakes taken up on a passenger car (four-wheel truck)?

A. By the lower rod of the trucks and adjust the piston travel with the dead levers.

675. Q. How is the slack of the brakes taken up in freight service?

A. By the lower rod of trucks and adjust the piston travel by the dead lever.

676. Q. What distance is a nice piston travel for passenger service?

A. Five to seven inches.

677. Q. What distance is a nice piston travel for freight service?

A. About five to eight inches.

678. Q. When taking up the slack of the brakes of a loaded freight car, do you ascertain if the beams are hung from the truck bolster?

A. Yes; if so, the piston should not be adjusted much shorter than seven inches.

HANDLING OF FREIGHT TRAINS

679. Q. In making an application, how many pounds should be made for the first reduction?

A. I would use judgment. If the train was about thirty air cars, the first reduction should be about five or six pounds; if longer, I would make the reduction seven to eight pounds.

680. Q. Why do you make the first reduction more on a long train than on a short one?

A. The exhaust port in the engineer's valve being the same size, the reduction from the long train is slower (owing to volume), therefore it requires more of a reduction in a long train than a short one to move the pistons by the leakage grooves.

681. Q. Would it be necessary to make another reduction of five pounds to increase the application?

A. No; the piston in all the brake cylinders have moved by the leakage grooves, the application could be increased by making slight reductions.

682. Q. When making the first reduction, do you pay particular attention to exhaust of train-pipe air?

A. Yes, to see if the exhaust conforms with the one made when testing the brakes.

683. Q. At which reduction is the most braking power obtained, first or second?

A. Second reduction, if it be the same number of pounds as the first.

684. Q. Why so?

A. Because the piston has moved by the leakage groove, air pressure being in the cylinder, there cannot be the expansion.

685. Q. Having a reasonable distance to make the stop, what reduction should be made the heaviest?

A. First.

686. Q. Why so?

A. Because the train is running the fastest at that time; also to move the pistons by the leakage grooves.

687. Q. How should the braking power be increased?

A. By light reductions, two or three pounds, and the stop will be very easy and smooth.

688. Q. In making a stop for a water column or coal pocket, the train was stopping fifteen or twenty cars short, should the brakes be released (kicked off) and caught again with the second application?

A. No, sir; if a train is handled in that manner there will be damage caused to the draft rigging, which may take hours to chain, freight trains should be stopped with one application.

689. Q. What should be done when the freight train is stopping short?

A. Allow the train to come to a positive stop, cut the locomotive off, then go for coal or water.

690. Q. Whenever the locomotive is cut off of a train and is going to couple on again, is it a good idea to leave the brakes set on the train?

A. Yes; when the locomotive is coupled on again, if the angle cocks are not opened (between tender

and car), the train cannot be started or would haul hard, which will indicate something wrong.

691. Q. How would you handle the engineer's valve, when backing up to a train, to prevent the brakes from sticking on the locomotive and tender?

A. Make an application controlling the speed of the locomotive, release it and immediately lap the valve before the cocks are open (if necessary make two applications); by so doing, it reduces the auxiliary reservoir's air of the locomotive and tender, preventing the brakes from remaining on same, when cocks are opened between tender and cars.

692. Q. When an application is made and it is found that you do not want to stop the train (speed of the train about ten miles per hour), should the brakes be released?

A. If the application be of fifteen to twenty-five pounds, I would allow the train to come to a positive stop before releasing, taking no chances of damaging draft rigging.

693. Q. If the reduction be ten to twelve pounds?

A. I would use judgment, relying on conditions, road bed, load of train, main reservoir equipment and brake equipment of locomotive, if the capacity of main reservoir was large, locomotive equipped with duplex governor, road bed level or a little up grade, I would release. If the engine be equipped with straight air, I would release at any speed.

694. Q. How would you operate the brake valve when releasing?

A. Place the handle of the valve in release position and leave it there for a minute or two (for it requires seventy-six seconds to raise the train-pipe air two pounds in the rear end of one hundred cars;

main reservoir, ninety pounds, capacity sixty thousand cubic inches or forty-two seconds to do the same work when the main reservoir air is one hundred and thirty pounds).

695. Q. When the handle is moved to running position, would you move it again to release position?

A. Yes. The brakes on the head end of the train would have a tendency to charge with a higher pressure than those in rear and would re-apply, the second movement of handle would release them, the pressure being equalized, they would not set again.

696. Q. How would you handle a mixed train, all air cars ahead?

A. Make as light a reduction as possible, so as to not increase the braking power too rapid, preventing the non-air cars, especially if loaded, to surge; straining the draft rigging, great care should be taken to hold the slack of the train together and not allow it to run out.

697. Q. How does the straight air assist you when releasing?

A. When operated, it retains the brakes on the locomotive and tender, holding the slack of the train together, preventing the train from parting.

698. Q. How can the straight air valve be operated?

A. Just before the handle of the automatic valve is placed in release position, the handle of straight air valve can be placed in application position, which will keep the brakes applied on locomotive and tender. After brakes have been released on cars, release straight air slowly.

699. Q. On making a reduction in service position No. 4, the, exhaust from train pipe being very

short (when the exhaust should be long), would that indicate any trouble?

A. It would indicate that an angle cock had been closed, or in winter time, probably, ice had formed in a hose or coupling.

700. Q. If the exhaust was very short, piston rising and making the second exhaust instead of one long one, what would that indicate?

A. An angle cock partly closed or communication of train pipe partly obstructed; winter time, look for ice in hose or coupling.

701. Q. When should the handle of the brake valve be placed in No. 5 position (emergency)?

A. Only in the case of an emergency.

702. Q. Would you leave the handle in No. 5 position?

A. Yes, until the train stops.

703. Q. If there was a service application made and an emergency arose, what should be done?

A. Throw the handle of the valve to No. 5 position, regardless of the reduction made, leave the handle there until the train stops.

704. Q. Can there be an emergency application made after the brakes are once applied in service?

A. No, though when a light reduction has been made, the emergency features of the triple valve can be put into action, getting a partial emergency, even though the quick action features do not act, the train-pipe air is exhausted quicker, setting the brakes more rapidly when the handle is placed in No. 5 position.

BRAKES CUT OUT. FREIGHT SERVICE

705. Q. How many cars should be run together in a train with the brakes cut out?

A. Not over two, and the brakes of the car next to the tender should never be cut out.

HANDLING OF PASSENGER TRAINS

706. Q. When making a service application for an ordinary stop, how many pounds should be made for the first reduction?

A. After making one or two applications I would then determine how many pounds should be made for the first reduction, usually the first reduction can be made of six to ten pounds, obtaining good results.

707. Q. How can the application be increased?

A. By lighter reductions, judging the distance the train is to be stopped in; also speed, adhesion of brakes and road bed. When within the distance of about six or eight car lengths of the desired stop, speed of train should be reduced to about five or six miles per hour, throw the handle of valve in release position, releasing all the brakes, bringing the handle back to lap, then making a reduction of five or six pounds (light reductions at intervals if required, using judgment), leave the brakes applied until stopped (if train was short, release at about the last roll of the driver).

708. Q. Then you would handle the passenger train with a second application, would you?

A. Yes.

709. Q. Why so?

A. When the train is handled with a second application, the trucks are not canted so badly when the stop is made, or is there so great a braking power, making the stop more smooth and more agreeable to the passengers and not any danger of sliding the wheels.

710. Q. Why should the brakes be left applied with a light application on a long train?

A. As a light application being left on when the train is long is not disagreeable to the passengers, it prevents any unnecessary strain to the draft rigging, such as might occur if the brakes were released at the last roll of the drivers.

711. Q. If the locomotive was equipped with a straight air brake, could that be operated at time of release, so as to prevent a long train from breaking in two?

A. Yes. By operating the straight air valve and holding a light application on locomotive and tender.

712. Q. Why should the brakes of a passenger train, when short, be released just before it comes to a stop?

A. To avoid or overcome that sudden check of train, which occurs when brakes are left on and is very disagreeable to the passengers.

713. Q. Have you noticed there are times when a stop is being made, brakes are released sooner than others?

A. Yes; that depends on the application, if there is a heavy application on, the brakes can be released sooner than they could if the application was light.

714. Q. Explain why?

A. With a heavy application there is more air in

the brake cylinder, which requires a longer time to discharge than with a light application.

715. Q. When making an application, which reduction should be made the greater?

A. The first reduction.

716. Q. Why should the first reduction be made greater?

A. At that time the train is running at the highest rate of speed and there is less adhesion of the brake shoes on the wheels.

717. Q. Does the adhesion of the brake shoe increase as the speed decreases?

A. Yes, that is why the reduction of train-pipe air should be made lighter as the train slows up, avoiding all unnecessary shocks to the train.

718. Q. What should be done when making a stop where the station is on a grade?

A. Make the stop with the second application, allowing the application to remain on until ready to proceed.

719. Q. Are there good results obtained from kicking off a few of the brakes when the passenger train is very long?

A. No, it causes unnecessary shock to the draft rigging and sometimes parts the train.

720. Q. Is there good results obtained when the train is short?

A. Not the best.

721. Q. Explain why?

A. Usually when the brakes are kicked off there is always one or more remaining on, the rear, which will naturally stretch the train; on making the second application, the brakes which were not released, will set with a greater brake power, keeping the train

stretched, when the final release occurs will always cause more or less shock or jar to the train.

722. Q. How can you avoid the shock you speak of?

A. By allowing the handle of valve to remain in release position a trifle longer, releasing all of the brakes (before lapping it), so on making the second application, the braking power throughout the entire train will be as near uniform as possible, then when making the final release the train is not so apt to have the unpleasant jar.

723. Q. When making a positive stop, such as for water or coal, at times for baggage, how should the train be handled?

A. The speed of train should be reduced to about three or five miles per hour or less, according to distance by the first or second application, then using good judgment and finishing the stop with a service application.

724. Q. When should the handle of valve be placed in No. 5 position?

A. Only in case of emergency.

725. Q. Then it should not be placed there for a water stop, should it?

A. No; it is not necessary to use that position, or even place the handle on the edge of No. 5 to make water, coal or baggage stops.

726. Q. Should the brakes be left applied at coal or water and baggage stops?

A. Yes.

727. Q. How should the high pressure brake be handled?

A. Same as the low pressure brake.

728. Q. In operating the high pressure brake, is the application felt sooner?

A. Yes.

729. Q. Why so?

A. Because it does not require the time to exhaust high pressure. When the pressure is seventy pounds and equalizing reservoir ten by fourteen and one-half inches, time to exhaust twenty pounds is about six and two-fifths seconds, when the pressure is one hundred and ten pounds, time is about four and one-fifth seconds.

730. Q. As it requires less time to exhaust the air, what is the action of all the pistons?

A. The equalizing piston and every triple piston acts quicker.

731. Q. Does the air of auxiliary reservoir enter brake cylinder more rapidly?

A. Yes.

732. Q. Then it is necessary to keep the equipment in a better lubricated condition, is it not?

A. Yes, to obtain good and satisfactory results.

733. Q. What will cause a quick action triple valve to operate emergency, when a service application was desired?

A. Broken graduating valve or pin; at times a weak graduating spring (Westinghouse); weak vent valve spring (New York) and a tardy or sluggish acting equalizing or triple piston.

734. Q. How can the triple having the defect be located?

A. Charge the system to standard pressure, when the defect is a broken graduating valve of pin it can be located by making a light reduction of about

three or four pounds (just enough to move the piston of the brake cylinder by the leakage groove), making an examination, on finding one brake that is not set (usually that is the one), have another reduction made, if the brake that is not set applies with the emergency, that is the defective triple.

735. Q. What should be done with it?

A. Release the brake and cut that one out, reporting same (be governed by the rules of the road)?

736. Q. Can a tardy or sluggish piston be located the same way?

A. At times it can, though there have been times when all the brakes except one has been cut out and application made, trying a different car of the whole train at each application and finding the one with the sluggish piston.

737. Q. Can an engineer know by the train pipe exhaust if the brakes have applied with undesired emergency?

A. Yes, he can positively tell, if the train pipe exhaust is cut off very sudden, a quick flash being obtained only the triple which is causing the trouble is in head end of train.

738. Q. Do you understand that a triple valve with a sluggish piston has tendencies to operate with the undesired emergency when being operated more so with high pressure than with low pressure?

A. Yes.

739. Q. When a locomotive that is not equipped for high pressure is coupled to a train run with high pressure, what should be done?

A. After coupling is made between tender and car, and cocks open, the engineer will reduce the

black hand's pressure to fifty-five pounds and wait about thirty seconds before he releases the brakes.

740. Q. Why is it necessary to wait so long?

A. To give the high-speed valve ample time to reduce auxiliary and cylinder to normal (sixty pounds).

741. Q. If the cross-over pipe is broken between cut-out cock and triple valve, what should be done?

A. Cut the brakes out on the car and tie up the pipe, location of car in train would be governed by rules of the road.

742. Q. If the cross-over pipe is broken between cut-out cock and train pipe, what would you do?

A. If possible, plug its connection to train pipe, in plugging with wood be very careful that the communication of train pipe is not obstructed, location of car in train would be governed by rules of the road.

743. Q. If the train pipe was broken?

A. I would be governed by rules of road.

744. Q. Whenever the train pipe is broken and the car is run in rear of train, no matter how short the distance might be, what precaution should be used?

A. The hose between the last two cars should be coupled, all angle cocks opened ahead of the one on forward end of rear car, the cock on forward end of rear car should be closed, a man left in this car when ascending grade, as to final location of car in train, be governed by rules of the road.

745. Q. How would you proceed if the train parted (freight or passenger)?

A. Shut off steam and lap the valve.

746. Q. Why would you lap the valve?

A. To save main reservoir air.

BRAKES CUT OUT. PASSENGER SERVICE

747. Q. How many passenger cars should be run together with the brakes cut out?

A. Not any. If the brakes of two passenger cars become defective and they are together in the train, they should be switched, a car with the brakes operating placed between them, the brakes of the car next to the tender should never be cut out.

GRADE BRAKING

748. Q. Should the condition of the brakes be known before descending a grade?

A. Yes, sir, by an actual running test.

749. Q. When and by whom are the pressure retaining valves placed in readiness for an application?

A. At the top of the grade by the train crew.

750. Q. What speed should the train be allowed to gain before an application is made?

A. Never allow it to obtain a speed that cannot be controlled by an application.

751. Q. About how many pounds should the first reduction be?

A. That would depend on conditions, grade, condition of brakes and number of cars in train, also number of air cars, five or six pounds or more if necessary.

752. Q. How should the application be increased?

A. By making light reductions, increasing the brake power gradually, getting down the grade as far as possible with the one application, at the same time, slowing the train down to a safe speed, that when the release was made the auxiliary reservoirs,

with the assistance of the pressure retaining valves, would have ample time to recharge before the train gained such speed that it could not be controlled by an application.

753. Q. On arriving at the bottom of the grade, what should be done with the retaining valves?

A. Turn the handle down.

754. Q. How should a train be left standing on a grade?

A. By the application of the hand brakes, if the cars are so equipped with the air brake that an application of it caused a strain on the chain of the hand brake, the release cock (or bleeder) should be opened and auxiliary reservoir air exhausted.

TESTING BRAKES OF A LOCOMOTIVE AND TENDER

755. Q. Explain how to test the brakes of a locomotive?

A. If locomotive is running high speed, always test with high pressure, start the pump, ascertaining its condition, see that the pump governor and feed valves are working properly and regulate the air at the standard pressures, that the engineer's valve is in good condition, that it is a perfect divider between main reservoir and train pipe when on lap, that the preliminary exhaust port discharges air from equalizing reservoir in the proper time, that the equalizing piston is working free, make an application of twelve to fifteen pounds, ascertaining the travel of piston, (locomotive and tender), examine all piping, hose and couplings, seeing there are not any leaks, also the pipe clamps are in good condition, examine connec-

tions, levers and pins, seeing they do not bear on some foreign material, also see that brake shoes are in condition for the trip, ascertaining if the triple responds with light reductions, causing the brake to apply and remains set, test the air whistle, seeing if it be in condition for the trip, ascertaining the pressure, also if reducing valve and diaphragm of signal valve responds promptly.

OPENING OF ANGLE COCKS

756. Q. When coupling charged cars to non-charge cars, which cock should be opened first?
A. The cock on the non-charged cars.

757. Q. How should the cock on the charged cars be opened?
A. Very slowly, so as to prevent an emergency application.

758. Q. When coupling charged cars to charged cars, which cock would you open first?
A. The one nearest the engine should be opened slowly.

759. Q. Why do you open it slowly?
A. To prevent the emergency application.

760. Q. How should the other be opened?
A. Slowly.

761. Q. Why would you open it slowly?
A. To prevent the emergency application, if the pressures were unequal.

762. Q. When coupling a locomotive to a charged train, which cock should be opened first?
A. Open the one on the tender slowly.

763. Q. Do you understand the amount of air which it requires to fill a pair of empty hose, when the cock is opened quickly, will cause the brakes of the entire train to set with quick action (emergency) and when it is opened slowly will not cause the brakes to set?

A. Yes.

AIR SIGNAL

764. Q. What are the essential parts of an air signal?

A. Reducing valve, signal valve and whistle, signal train pipe, strainer, cut-out cock and branch pipe, car discharge valve, line cocks, and a pair of flexible hose and couplings.

765. Q. What is the standard signal pressure?

A. Forty pounds.

766. Q. How is the forty pounds obtained?

A. By the reducing valve.

767. Q. What is the duty of the reducing valve?

A. It automatically regulates the communication between main reservoir and signal system.

768. Q. What is the duty of the signal valve?

A. It operates the pressure between the upper and lower side of its diaphragm and to the whistle connection when a reduction is made.

769. Q. What is the duty of the signal pipe?

A. To convey the air back, distributing it to each car.

770. Q. Where is the line straight cock located?

A. It is located in the signal train pipe, near the end or edge of platform.

771. Q. What is the position of the handle when open?

A. Crosswise, when open; lengthwise, when closed.

772. Q. If the handle was broken off, how would the position of the plug be known?

A. By the proof mark which is in the top of all plugs.

773. Q. What is the position of the proof mark when open?

A. In line with pipe.

774. Q. What is the cocks used for?

A. To close communication in the line pipe, between the cars, whenever the hose is to be uncoupled.

775. Q. What are the flexible hose and couplings used for?

A. To unite the train pipe between the cars.

776. Q. What is the branch pipe used for?

A. To convey the air from the line pipe to the car discharge valve.

777. Q. What is the car discharge valve used for?

A. It is used to operate the pressure between line pipe and atmosphere, whenever it is desired to sound the air whistle, located on the engine.

778. Q. How should the car discharge valve be operated?

A. The rope attached to lever of valve should be pulled quickly (opening the valve), getting a sharp discharge, allowing about three seconds to elapse before valve is again operated.

779. Q. Where is the cut-out cock located?

A. In the branch pipe, near the discharge valve.

780. Q. What is the position of the handle when closed?

A. In line with pipe.

781. Q. Explain the operation of the signal valve (Westinghouse)?

A. The signal valve being connected to the signal line by a branch pipe, the air which is in signal line has a free passage to it, feeding the top of diaphragm through a restricted port, thence to under side of diaphragm by a restricted passage way, the pressure equalizing, the diaphragm being a divider between the two chambers, a reduction of signal line air reduces the pressure off the top of diaphragm, the air under it lifts it, raising the rod (which performs the features of the valve) from its seat and for a moment the air which is under diaphragm and signal pipe discharges to the whistle, the diaphragm moving down, causing its rod to seat, closing the port.

782. Q. What is the action of the reducing valve?

A. It responds and feeds the line.

783. Q. When the whistle blows at the release of the brakes, what trouble does that indicate?

A. It indicates that signal is charged to main reservoir air, the trouble is in the reducing valve.

784. Q. There are times when the whistle blows from an unknown cause when the train is running.

A. That is due to leak in signal pipe or hose coupling, and usually occurs when going over frogs or rounding curves.

785. Q. When there are two distinct whistles obtained instead of one, what is the trouble?

A. Usually the car discharge valve is held open too long.

786. Q. When there is one good distinct whistle and one or more faint whistles, what is the trouble?

A. Rebounding of the diaphragm.

787. Q. What causes the diaphragm to rebound?

A. Usually it is old and baggy.

788. Q. When the whistle will operate from a short train and not from a long one, what would that indicate?

A. The trouble is in the signal valve, poor diaphragm or a small hole in same, or a loose fitting diaphragm rod.

789. Q. When the whistle can be operated from a car in the train and not from another, what would that indicate?

A. If the car which the whistle could not be operated from was ahead, it would indicate the trouble was in the car; if the car was in the rear of those which it could be operated from, the trouble usually is in signal valve.

790. Q. Is there a strainer in the signal line of each car?

A. Yes; it is located in the line tee, where the branch pipe is connected.

791. Q. Where should the strainer, signal, and reducing valve be located?

A. They should be located in the cab in some convenient place, not too close to the boiler.

792. Q. Explain the operation of the (New York) signal valve?

A. The New York signal valve is connected in the same manner as the Westinghouse, air passing in on top of diaphragm through a restricted port, thence to underside of diaphragm through a restricted port (which is in center of diaphragm) and

equalizes, the diaphragm being the divider between the two chambers. The air also has communication around the small pivot valve, a reduction being made in signal line reduces the pressure on top of diaphragm, the air under it being greater, moves it up, at the raising of the diaphragm it acts on the pivot valve, causing it to raise from its seat, admitting air to the whistle, for a moment the air from upper and lower side of diaphragm is discharging, the diaphragm moving down and pivot valve seating (closing the port), remaining so until another reduction is made.

LEAKS

793. Q. What effect does the leakage of main reservoir air have on the system?

A. It would cause unnecessary work for the pump.

794. Q. What effect does leakage of equalizing reservoir air have on the system?

A. It destroys the equalizing features of the engineer's valve, equalizing piston will not seat when making a service application, also unnecessary work for pump.

795. Q. What effect does leakage of train-pipe air have upon the system?

A. It has a tendency to increase the application above which the engineer intends, causing the train to stop short, also unnecessary work for the pump.

796. Q. What effect does leakage of auxiliary reservoir air have on the system?

A. It destroys the braking power of that vehicle,

also creates a leakage of train-pipe air and makes unnecessary work for the pump.

797. Q. What effect does leakage of brake cylinder air have upon the system (brake applied)?

A. It reduces or destroys the braking power of that vehicle.

798. Q. What effect does leakage of signal pipe air have upon the signal system?

A. It has a tendency to cause the air whistle to blow.

799. Q. Is there any part of the air brake which can have leakage that does not cause unnecessary work for the pump?

A. No.

THE ESSENTIAL PARTS OF AN AUTOMATIC AIR BRAKE ON A LOCOMOTIVE

1. Air pump.
2. Main reservoir.
3. Duplex gauge.
4. An engineer's brake and equalizing discharge valve.
5. Pump governor.
6. Train pipe.
7. Cross-over pipe and cut-out cock.
8. Triple valve.
9. Auxiliary reservoirs.
10. Brake cylinders.
11. Induction pipe.
12. Release or bleed cock.
13. Angle cocks.
14. A pair of flexible hose and couplings.

15. Cut-out cock (double heading).
16. Pressure retaining valve.

For high speed or straight air, see high speed and straight air questions.

TENDER, FREIGHT OR PASSENGER CARS

1. Train pipe.
2. Cross-over pipe and cut-out cock.
3. Triple valve.
4. Auxiliary reservoir.
5. Brake cylinder.
6. Induction pipe.
7. Release or bleed cock.
8. Pair of angle cocks.
9. Pair of flexible hose and couplings.
10. Pressure retaining valve.

For high speed and straight air, see high speed and straight air questions.

800. Q. Is there another essential part in passenger service?

A. Yes, a conductor's valve.

CORRINGTON CONSOLIDATED BRAKE VALVE

801. Q. What is it used for?

A. For operating the air between main reservoir and train pipe, and between train pipe and atmosphere, when applying the brakes; between train pipe and auxiliary reservoir; between auxiliary reservoir and brake cylinder, applying the brakes; between brake cylinder and atmosphere, releasing the brakes (triple features), also between main reservoir and brake cylinder, applying the brakes; between brake

cylinder and atmosphere, releasing the brakes (straight air feature).

802. Q. Are there triple valves applied to the system?

A. There is a triple or distributing valve in the lower section of the brake valve, which performs the features of a plain triple.

803. Q. How many positions has the automatic valve?

A. Six.

804. Q. Name them?

A. No. 1, release position; No. 2, running position for high pressure; No. 3, running position for low pressure; No. 4, lap position; No. 5, service application position; No. 6, emergency position.

805. Q. What communication is there in release position No. 1?

A. Direct communication between main reservoir and train pipe, including equalizing reservoir; also the warning or alarm port is open.

806. Q. Name the air discharging through the warning port?

A. Train-pipe air.

807. Q. What would be the result if the handle was left in release position?

A. Same as Westinghouse.

808. Q. What communication is there in running position No. 2?

A. There is communication between main reservoir and train pipe, also equalizing reservoir.

809. Q. How long would this communication remain?

A. This being running position for high pressure, it would remain until train pipe and auxiliary

reservoir was charged to one hundred and ten pounds; the feed valve (to the left or first) would automatically close communication between main reservoir and train pipe, pump would continue on until the required amount of excess had been accumulated in main reservoir.

810. Q. What communication is there in running position No. 3?

A. Same as in No. 2, only this position is controlled by the center feed valve, which is set to regulate the train-pipe air to seventy pounds.

811. Q. What communication is there in position No. 4?

A. Not any, No. 4 is lap.

812. Q. What sort of pressure is the air in the equalizing reservoir made?

A. It is made an individual pressure, same as Westinghouse.

813. Q. What is the divider between main reservoir and train pipe?

A. When the handle is on lap No. 4 position, the rotary valve becomes the divider between the main reservoir and train pipe, also between main reservoir and equalizing reservoir.

814. Q. What is the divider between equalizing reservoir and train-pipe air?

A. Equalizing piston.

815. Q. What communication is there in No. 5 position?

A. The preliminary exhaust port is open.

816. Q. Name the air the preliminary exhaust port discharges?

A. Equalizing reservoir air (reducing air on top of the piston).

817. Q. What is the action of the equalizing piston?

A. It raises and discharges about an equal amount of air from the train pipe.

818. Q. Can it be determined by the discharge as to about the number of air brake cars in the train?

A. Yes.

819. Q. What communication is there in No. 6 position (emergency)?

A. Direct communication between train pipe and atmosphere, opening of a large port, causing a sudden reduction of train-pipe air.

820. Q. Does the equalizing piston operate?

A. No.

821. Q. When making a service application, how is the air in equalizing reservoir operated?

A. By the engineer.

822. Q. How is the train-pipe air operated?

A. By the equalizing piston.

823. Q. Where is the straight air valve located?

A. It is consolidated with the automatic valve.

824. Q. How many positions has it?

A. Four.

825. Q. Name them?

A. No. 1, independent release, for the locomotive and tender brakes, regardless of how they have been set; No. 2, normal release or running position; No. 3, lap; No. 4, application.

826. Q. What communication is there in No. 1 position?

A. Direct between brake cylinder and atmosphere.

827. Q. What communication is there in No. 2 position?

A. Indirect between brake cylinder and atmosphere.

828. Q. What communication is there in No. 3 position?

A. Not any, that is lap.

829. Q. What communication is there in No. 4 position?

A. Direct between main reservoir and brake cylinder.

830. Q. Is there a warning or an alarm port in the straight air valve?

A. Yes. It is in communication when the handle is in independent release position.

831. Q. Why is the warning port in the valve?

A. To warn the operator not to carry the handle in that position.

832. Q. Why not?

A. The brakes of a locomotive and tender could not be applied.

833. Q. Do you obtain full main reservoir air for braking power with the straight air brake?

A. No, about forty-five pounds.

834. Q. How is the straight air regulated to forty-five pounds?

A. By a feed valve.

835. Q. Where is the feed valve located?

A. It is bolted to the body of the automatic valve (to the right), or third valve and is set for forty-five pounds.

836. Q. How many feed valves has this system?

A. Three. One for high and low pressure and one for straight air.

837. Q. Can the brakes be operated on locomotive and tender without operating same on train?

A. Yes, with the straight air.

838. Q. Can the brakes be operated on the train without being operated on the locomotive?

A. Yes.

839. Q. Explain.

A. By placing the handle of the straight air valve in independent release position and making an application with the automatic valve.

840. Q. Can an automatic application be retained on the locomotive and released on train?

A. Yes, by lapping the straight air valve just before releasing the automatic.

841. Q. Can the brakes be released on the locomotive and tender without releasing on the train?

A. Yes, by placing handle of straight air valve in independent release position.

842. Q. Can the brakes of the locomotive and tender be applied by a straight air application and immediately increasing the application with the automatic?

A. Yes, or vice versa.

843. Q. Can the brakes of a locomotive be applied with the automatic valve and released with the straight air valve?

A. Yes.

844. Q. How should a train be handled down a grade with the Corrington valve?

A. When making an application with the automatic valve, place straight air valve in independent release position, when train is slowed down to a safe speed (that the auxiliary reservoirs will have ample time to recharge before another application), release

the brakes. Just before releasing, place the straight air valve in application position which will apply the brakes of locomotive and tender with straight air, preventing any possible chance of the train parting. After brakes are released straight air can be released if so desired. By this system, the braking power of the heavy locomotive can be utilized for brake braking when it is most needed to assist the pressure retaining valves in steadying the train, while the auxiliary reservoirs recharge, without any more wear of the shoes or tires than is caused by an application of the ordinary automatic brake.

845. Q. How should the valve be operated in freight service?

A. When it is desired to release while the train is in motion, place the handle of straight air valve in application position before releasing the automatic; by so doing, the brakes of locomotive and tender will be retained, preventing any possible chance of the train parting. After automatic brakes of the cars have been released, release straight air slowly.

846. Q. How should the valve be operated in making passenger stops?

A. As it has been found advisable to make passenger stops with the second application, make the final release a trifle quicker with this system and just before it is made (lap the straight air valve, if the condition of the brakes of the locomotive and tender are fair, if not) apply the straight air lightly. By so doing, the stop will be finished with the straight air, avoiding all shocks or jars (which are very disagreeable to the passengers), which occur at different times when making an ordinary stop.

847. Q. Do you understand the operation of the feed valves and pump governors?

A. Yes, same as other brake companies.

848. Q. Is it necessary to take the valve apart to oil the rotary valve seat?

A. No, remove the handle nut, then remove a stem, drop in a few drops of valve oil, replace the stem and nut and the rotary seat will get lubricated.

849. Q. Can this be done when the gauge records pressure?

A. Yes.

850. Q. Has this system cut-out cocks for truck, driver and tender brakes?

A. Yes.

851. Q. Where are they located?

A. The one for the tender brake cylinder is located in a fitting just below the brake valve; the one for the tender auxiliary reservoir is near its auxiliary, under the running board; the one for the driver brake cylinders is near the cylinders; the one for the driving brake auxiliary reservoir is near its auxiliary, under the running board; the one for the truck brake cylinder is in the pipe, leading to it; the one for the truck brake reservoir is near its auxiliary, under the running board.

DOUBLE HEADING

852. Q. How would you proceed to double head (second locomotive)?

A. There is a small lever located between the high and low pressure feed valve, which operates a small rotary valve (the rotary valve operates service train pipe exhaust port), known as the double-heading valve, when this handle points down (vertical), the train pipe exhaust is open. To double head

(second locomotive), the lever would be moved to the right (angle about forty-five degrees), which would close the exhaust port; place the handle of the automatic valve on lap position No. 4.

853. Q. What should be done with the straight air valve?

A. Not anything; leave the handle in No. 2 running position (normal).

854. Q. Has the engineer of the second engine entire control of the brakes on locomotive and tender?

A. Yes; he has the brakes absolutely in his control by the feature of the straight air valve.

855. Q. If an application be made from the engineer's valve of the first locomotive and the engineer of the second locomotive notices the wheels are sliding of the second locomotive, can the brakes be released without interfering with the brakes of the first locomotive and cars?

A. Yes.

856. Q. How would you proceed?

A. Place the handle of the straight air valve in independent release position.

857. Q. If the brakes be applied by the engineer's valve of the first locomotive for the purpose of slowing the train or making the stop, can the engineer of the second locomotive operate the brakes on the locomotive, so that there is no possible chance of the train parting, should the man on the first locomotive release the brakes while the train was in motion?

A. Yes.

858. Q. How would you proceed?

A. Place the straight air handle in application position.

859. Q. If the engineer of the second locomotive was called upon to make an emergency application, how would he proceed?

A. Throw the handle of the automatic valve to position No. 6, also operate straight air valve in application position.

860. Q. Why would you operate straight air valve also?

A. To replenish any leakage of brake cylinder pressure of locomotive and tender.

DEFECTS

861. Q. What effect has a leaky graduating valve on the system?

A. Cause the brakes to have a premature release unless full set (same as other systems).

862. Q. What effect would a leaky slide valve have?

A. Cause a blow at the exhaust of straight air valve, when handle is in No. 2 release (or running) position.

863. Q. What effect would a leaky straight air rotary valve have?

A. Cause a blow at the exhaust of straight valve.

864. Q. How could either defect be located?

A. Lap the straight air valve, if the blow continued, it is the straight air rotary valve leaking.

865. Q. What effect has a leaky rotary valve, top body gasket, feed valve, or feed valve case gasket (in the automatic valve)?

A. Same defect will arise from these as those in the Westinghouse system.

866. Q. How can a defective rotary valve, top body gasket be determined from the feed valve or its gasket?

A. Test the same as of Westinghouse.

867. Q. How can a defective rotary valve be determined from a top body gasket?

A. By lapping the valve, if the black hand raises quicker than it does when in running position, the defect is in the top body gasket, if not, it is in the rotary valve.

868. Q. If the lower body gasket was broken between main reservoir and top of triple piston (train-pipe air), what effect would that have on the system?

A. The equalizing piston would not seat when valve was lapped, it also has a tendency to cause the equalizing piston to remain from its seat when valve is in running position (light locomotive).

869. Q. What effect would a leak in the (black hand) gauge pipe or equalizing reservoir air have on the system?

A. Same as Westinghouse.

870. Q. How could a leak in the equalizing reservoirs air be determined from a leak in the lower body gasket?

A. When valve is lapped, a leak in the equalizing reservoir will cause the black hand to fall and equalizing piston raising, discharging train-pipe air. Where the trouble is in the lower body gasket, it will cause the piston to raise (when valve is lapped) without the falling of the hand.

871. Q. How would you proceed if the gauge or governor pipes were broken?

A. Same as the Westinghouse.

872. Q. How would you proceed to brake if the brakes could not be applied in service position No. 5?

A. Operate on the edge of the emergency, same as the Westinghouse.

873. Q. How would you proceed if the pipe leading to the equalizing reservoir was broken?

A. Blind its connection of the valve and close double-heading cock.

874. Q. How would you apply the brakes?

A. Same as with Westinghouse.

875. Q. What class of air gauge is used by this company?

A. Triplex.

876. Q. Why is it called triplex?

A. Because three pressures are recorded on the same dial.

877. Q. What air does the black and red hand record?

A. Same as of other brake systems.

878. Q. What air does the small black hand record?

A. When brakes are applied on locomotive and tender, it records brake cylinder air.

879. Q. Whenever the brakes of the locomotive and tender are applied, either by automatic or straight air, and the handle is placed on lap, what does the falling of the small black hand indicate?

A. Leakage of brake cylinder air.

880. Q. What is the feature of the high-speed automatic reducing valve?

A. Same as Westinghouse.

881. Q. Does it graduate the discharge of cylinder air on an emergency application?

A. Yes.

882. Q. Explain its operation?

A. It has a piston valve which operates three rows of ports in the bushing. Whenever an emergency application arises, auxiliary and cylinder air equalizes at about eighty-five pounds, the piston is moved (unseating, performing the valve feature), covering two of the three rows of ports in the bushing. The air now discharges to the atmosphere through one row, as the pressure is being reduced, the adjusting spring reacts, moving the piston upward, opening the second row of ports, discharging the air more rapidly. The third row of ports being opened, making the reduction still more rapid. When the braking power is reduced to about sixty pounds, adjusting spring reacts and causes piston to seat (performing the valve feature), closing the ports.

883. Q. How many valves are required for the equipment of a locomotive and tender with this system?

A. One, a consolidated engineer's valve, including a high-speed automatic reducing valve.

884. Q. Does the high-speed automatic reducing valve, applied to a locomotive, perform any other feature except in high pressure service?

A. Yes; it acts as a safety valve for the straight air brake.

CARE OF TRIPLE VALVES AND BRAKE CYLINDERS

885. Q. How often should the brakes be cleaned in passenger service?

A. The triple valves in passenger service should be removed, cleaned and tested every three months when operated by high pressure; if operated by low pressure, every six months.

886. Q. What test should be applied to the triple valve?

A. After the triple valve has been cleaned and oiled, it should be tested as per rules of the brake companies.

887. Q. Do you pay particular attention to the graduating valve and its pin?

A. Yes; see that the pin is not badly rust eaten or broken.

888. Q. How much oil does the piston and slide valve require?

A. A very small quantity, six to eight drops of good lubricating oil that will not congeal in cold weather.

889. Q. When cleaning, are you careful not to leave threads or lint of waste on any of the parts?

A. Yes; by using a piece of cloth to clean with, there is not the danger of lint.

890. Q. How often should the brake cylinder be cleaned and lubricated in passenger service?

A. The piston should be removed and brake cylinder cleaned every three months, where it is operated with high pressure; if operated by low pressure, every six months.

891. Q. Do you pay particular attention to the leather packer, notice if it will be durable until the next cleaning?

A. Yes.

892. Q. How much set is allowed for the packer expander?

A. The expander should fit the bore of the cylinder (its joint being open).

893. Q. Should the leakage groove be examined?
A. Yes, and cleaned.

894. Q. Where is the leakage groove located?
A. Some at the top; others at the side of the cylinder.

895. Q. What kind of a lubricant is used for the cylinder?
A. Grease.

896. Q. What amount of grease is used for cylinder?
A. About one and one half ounces for an eight-inch cylinder; two, for a ten-inch; two and one half, for a twelve-inch; three, for a fourteen-inch; three and one half, for a sixteen-inch.

897. Q. How often should the high-speed valve be cleaned and tested?
A. Once every six months.

898. Q. How often should the brakes in freight service be cleaned?
A. Once every twelve months.

899. Q. When cleaning and making repairs to the freight triple valve or cylinder, should the same care be given as those in passenger service?
A. Yes; they should undergo just as careful treatment.

900. Q. Should the auxiliary and the cylinder be stenciled the date of the last cleaning?
A. Yes.

901. Q. Does the angle and straight cock ap-

plied to the air brake system ever need any inspection?

A. Yes.

902. Q. Why so?

A. Some times the plug gets leaking and it requires grinding; other times the plug works hard and it requires lubricating.

903. Q. How many strainers are there in a car and locomotive brake equipment?

A. Two; one located in the train pipe at the cross-over pipe connection, and the other at triple valve union.

904. Q. Should these strainers ever have an inspection?

A. Yes; as the strainers have been known to get partially plugged.

905. Q. Is there any part of the air brake that you know of that does not require an inspection?

A. No; the air-brake equipment of each and every engine should be thoroughly inspected and all repairs made before the locomotive leaves the engine house. When locomotive is coupled to the train and has accumulated the standard pressure, a thorough inspection should be made of the brakes of the train and all repairs made (if any defects are found) before they are pronounced O. K.

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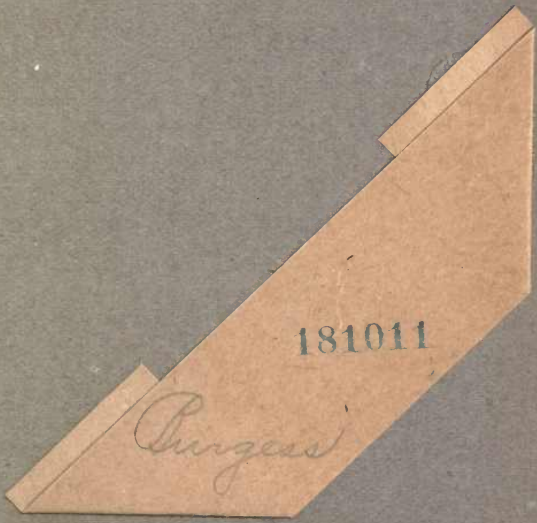
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